AMERICAN GAS JOURNAL

Established 1859

February 1934

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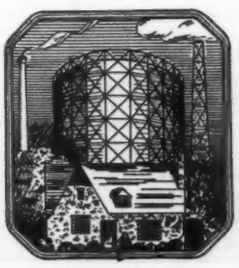

VOLUME 140
NUMBER 2

WHOLE
NUMBER 3722

WE DO OUR PART

PUBLISHED MONTHLY BY
AMERICAN GAS JOURNAL, Inc.
53 Park Place, New York

S. G. KRAKE, *President and Treasurer*
A. M. GLEASON, *Secretary*
H. M. RILEY, *Editor*
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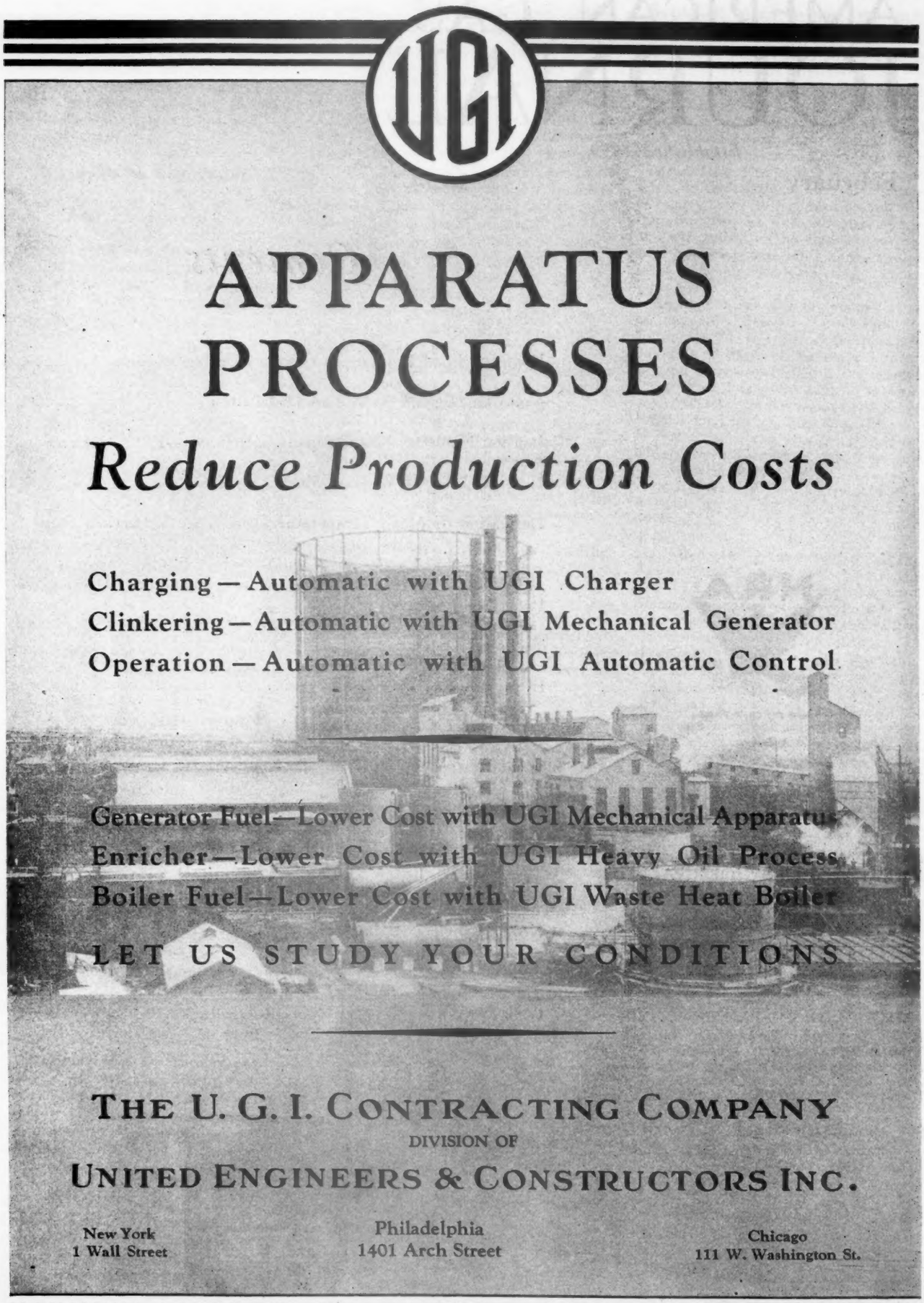
Subscription $2.00 per year U. S. A.; $4.00 Canada; $4.00 Foreign. Single copies 25 cents.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Editorials

The Less Deadly Species

IN THIS issue *The Copy Writer* recommends that gas companies direct a portion of their local advertising toward the less deadly species of the human family—this, despite the oft-repeated assertion that the woman influences to a very large degree the purchase of everything that goes into the home: from safety pins to automobiles. We agree with him that it is high time that some of our publicity be aimed at the man.

Get on any flat-wheeled commuters' train; ride any Toonerville Trolley; indeed, pay a visit to any home on a social call, and it is ten to one that you will hear someone—a male—extolling the virtues of the new grass cutter, or you will be yanked cellarwards to inspect and be harrowed with details of the new heating plant. If the wife happens to be showing someone else her new poke bonnet in the fastness of her bedroom, Mr. Husband will surely conduct you to the kitchen, where he will rave about the new monel metal sink or snappy gas range. Reason enough, say we, to give him a bit of mild publicity gunfire. He, poor wretch, will doubtless thank you for the small notice given him and, figures to the contrary notwithstanding, definitely influence the purchase of some of our equipment and thereby wax additionally loquacious; which will be all to our good.

And, do not mistake it, any newspaper advertising directed toward the male member of the family will be jolly well read by the opposite sex; witness the mad scramble of the female contingent to crash the gate at those places where the entrepreneur has adroitly flung to the breeze the sign, "For Men Only."

Household Technology

YOU will not have to look far afield for the woman who, in a pinch can take a blunt edge screw driver and get some mechanical household gadget in running order; and this virtually while the husband has been growling that Junior has mislaid or manhandled his pet set of tools, and has departed posthaste to summon a two-dollar-an-hour mechanic to rectify the difficulty.

Further, despite the fact that—to be specific—gas salesmen as a general thing are posted by the sales manager to steer clear of indulging in any conversation with the prospect that might smack of the technical or mechanical, most of us know that, when the housewife finds herself in a "jam" by way of something breaking down in the middle of her work, she will not wait overly long for service from headquarters before tackling the repair job herself—especially if there is a blunt edge screw driver handy.

Hence, one should not be surprised that New York University is starting this month a school for instruction of housewives in the mechanical intricacies of home gadgets. And when the course has been completed, we'll wager she will not need the above mentioned screw driver; she will be able to do wonders with a metal skewer. Meanwhile, Papa will still be all a-fever in his haste to summon the expensive mechanic.

As a final backlash, we will probably have the female prospect asking us a lot of questions that will tax our resources and cause the man on the floor of the gas company display room to dispense with a goodly amount of his conversational veneer.

Who knows but that very shortly two partners at the afternoon bridge club, by virtue of some side discussion, wherein are expertly passed back and forth such terms as "thermal lag," "cold seventy," "thermostatic control," and the like, will cause their opponents to make a faux pas.

Mr. Domestic Gas Salesman, en garde!

Good Discipline

DURING the "winter of our discontent" through which all gas companies have been passing for the past several years, many plant and distribution operators have doubtless fretted and stewed because some seemingly desirable piece of apparatus could not be purchased. Such times have almost forced more than one of these men to consider throwing up the sponge and looking for more lush, or at least less worrisome, grazing pasture.

This situation has not only acted as a disciplinarian but, better still, it has brought about the accumulation of many problems and afforded an opportunity to study them right down to the last figure. And, lucky the individual who has availed himself of the opportunity to worry out the same! He has assuredly put himself into a position where he can talk with weight and authority when the purse strings are loosened up a bit to take care of needed repairs and extensions. Always bear in mind that Lowe perfected his water gas process during the depression of the seventies.

Credit Is Due

THERE has been brought to our attention the fact that, for fifteen years straight running, American Stove Company has pushed gas as the perfect fuel in magazines with a national circulation. This has evidently been done at a very large cost and credit is due this organization for continuously carrying the gas man's story to the consuming public in such a wholehearted, dignified manner.

Henry M. Riley
Editor

• PER METER PER YEAR

Progressive gas executives are focusing the attention of the industry on closer control of measuring cost per meter per year and per MCF. Design, mechanical improvements, responsible manufacture and policies of meter maintenance are being weighed in terms of actual returns on meter dollars invested. We welcome this trend.

It is in keeping with the cooperation this company has long extended in the interest of accurate meter records. American Meter Company TINNED STEELCASE and IRONCASE meters—with regular or straight reading indexes—can be purchased with the assurance of accurate measurement and economical performance.

. . . also RELIANCE REGULATORS for close pressure control and positive lock-up.

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ESTABLISHED 1836

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AMERICAN GAS JOURNAL
February
1934

Domestic Load Building in Omaha

Renting Old Model Refrigerators, Close Cooperation with Dealers and Plumbers and Free Adjustment Service Are Producing Results

By LUCIUS S. FLINT

ALL-GAS MODEL KITCHEN
95% of Omaha's Housewives use GAS for Broiling, Baking and Cooking
METROPOLITAN UTILITIES DISTRICT.

Gas Kitchen Display of Metropolitan Utilities Company

AT the Metropolitan Utilities District, Omaha, Neb., the largest municipally-owned gas department in the United States, a customer may rent a gas refrigerator just as he would a house or a piece of business property.

The novel idea was one of four which played a highly important part in enabling the Nebraska utility to double its refrigerator installations during the past season, and to greatly increase the load on other appliances.

The lease plan was adopted as a means of placing a large number of water-cooled units which became obsolete when the new air-cooled machines were brought out. There were about 40 leftovers and comebacks in stock in the early spring when the leasing scheme was instituted. Within a few weeks, every one of them had been placed, and at the present time there are always several customers waiting for a chance at the boxes. The arrangement has been restricted exclusively to old models.

On a small box, the customer takes a lease agreeing to a flat rental fee of three dollars per month for a two year period, the sum payable each month. A large box rents for four dollars. The charges are based on selling price, and if at the end of two years, a patron wishes to buy the box, the amount he has paid in rent—$72 on the small unit and $96 on the large—can be applied. If the box is bought, there is added to the net balance a charge of 5% per year or 10% for two years, and the total divided into equal monthly payments. No interest charge is made anywhere in the first two years.

An example illustrates the plan. Suppose there is a balance of $150 when the customer decides to purchase, and he wants two years in which to pay out—of course a person's credit is always checked before making a contract, and in no case are the payments allowed to run more than two years. The interest charge at 10% amounts to $15, which is added to the balance, making a total of $165 to pay in 24 equal monthly payments—or about $6.88 per month.

At the end of the two year lease period, the customer must either buy the unit or take it on a month-to-month rental basis. Another lease would not be practical, for a box would be entirely out-of-date at the end of a second period. By this scheme the customer will be at liberty to end the arrangement at the end of any month, and the company

can call in a box if a market is found for it. Since there is no interest charge during the first two year rental period, the customer does not feel that money is being wasted on his original investment.

"Of course," says W. J. Barber, assistant to the general manager, "our hope is to sell most of the units at the end of the two year lease period. But if quite a number of them came back or were continued only on a rental basis, I believe the plan would have been very valuable because it would have acquainted a large number of people with the advantages of gas refrigeration and would have returned the greater part of our investment on models which couldn't otherwise be placed without a heavy loss. I am convinced that a majority of the people who have once had gas refrigeration won't give it up.

Applies Only to Old Models

"The plan would only be applicable in disposing of old models, for new ones can be sold directly, but it is excellent in cases of this kind. The lease plan is most popular among people who have not completely made up their minds as to what type of automatic refrigeration they want, among those who are not sure of being permanently located in a city and other similar types.

"A two year lease period is much preferable to an open rental plan, both for our protection in preventing too frequent turnover and consequent expense, and for the customer's protection."

The second refrigerator selling plan hinges on the use of a number of good dealers. "We believed that in order to compete with electric refrigeration it was absolutely necessary to have an increased number of outlets, and our increase during the past season indicates the soundness of our belief," says Mr. Barber. "However, we find care in selecting dealers equally important. Only high-class places having progressive selling organizations, are considered. We have one of the best furniture stores in Omaha, and five smaller outlets—not a great many, but enough to produce a lot more business than would be possible through our sales department alone.

"In order to get the class of business we want, we have made an arrangement very favorable to dealers. The dealer need have no investment except for samples, and the utility *does the installation and service work.* Our handling installation and service is a big inducement to independent houses, for they wouldn't be able to make anything on the small amount of work; they would actually lose money. We also prefer to do the work because we know it will be satisfactory and we have a chance to contact the customer. A dealer must have a good location and agree to give the units prominent display space at all times. We will finance any dealer desiring it, on a 6% basis."

The first $10 goes to the utility for installation. The next payments go to the dealer for his commission. Then, the utility takes the remaining payments. If the unit is still in at the end of a six-month period, the utility takes the risk for completion of the contract.

"In addition to helping us build load, this arrangement goes a long way toward creating good will among independents, which is very valuable in view of the great amount of opposition to utility merchandising," says Mr. Barber. "We must recognize that in the final analysis, independents can do a lot of harmful 'knocking' if they want to. This company avoids that."

Plumber Cooperation

Another worthwhile step taken by this utility has been the adoption of a plan of cooperation with plumbers. The plan has resulted in an average extra sale of 400 automatic water heaters and tank heater replacements per year. The plan is handled on a load-building commission basis. Any licensed plumber who will display automatic water heaters of a type approved by the American Gas Association is given a five dollar commission on all automatic installations or tank heater replacements he sells. The scheme is confined to automatic units on new installations because the utility wishes to encourage the use of this type of appliance.

"Here again it is a question of getting additional outlets and good will as well," explains Mr. Barber. "Never until the commission plan was adopted had most plumbers made any real effort to sell heaters. The profit in the appliance itself wasn't great enough to be any real inducement, and when a unit was sold, there were likely to be difficulties with poor installations, which reflected against the utility. Now, plumbers have an interest in selling every unit they can, and in seeing that it is properly installed and serviced; also, they give the utility a 'good word' whenever possible.

Heaters Must Be Approved

"One 'thorn in the flesh' in past years was that plumbers carried automatic heaters of a type not approved by the American Gas Association, making their sales on price competition rather than quality. When a heater got out of order or 'went bad' in a year or two, the plumber very often did not want to make it good, and the buyer tried to get the utility to make up the deficiency by doing something for the gas line. Sometimes the companies were out of business entirely shortly after the country had been flooded with their poorly constructed goods. Thus, it was often impossible to get repairs and parts for off-brand heaters.

"Under the present plan, the plumbers still do their own installation and service work, but all heaters must be of a standard, approved type, whether or not they bear the same trade mark as those shown in our own sales room. Our main concern is to see that the customer gets quality merchandise, whether it be ours or someone else's."

A free adjustment service on all appliances is the fourth important factor in the load-building program. It insures the user of minimum operation cost and satisfactory appliance performance. And at the same time it builds good will by impressing the idea of efficient service.

The utility maintains a crew of special men to make a continual canvass of customers' homes, doing nothing but adjusting burners. The entire city is covered on an average of once a year. The inspectors take a block at a time, calling at every customer's home. On the basis of 50,000 meters, from one to nine men are required for this work, the number varying from time to time during the year.

Notes on High Pressure Gas Distribution

On the Assumption That Many High Pressure Lines Are Over-Size Because of Emphasis on Continuity of Supply, Design Factors Are Analyzed with a View to Minimizing This Tendency toward Undue Increase in the Investment per Consumer

By DISTRIBUTION ENGINEER

INNUMERABLE discussions have arisen regarding the new business efforts necessary to meet the growing competition with other types of fuel. The fact that considerable mechanical advancement has been made in the utilization of competitive fuels must be recognized and one of the primary steps in meeting such competition is decreasing the investment costs per consumer rather than increasing sales activities. In the majority of instances high pressure designs have provided an over-capacity because of the emphasis placed on a continuous gas supply when no other competitive fuel has this expensive handicap. The importance of safety should not be minimized nor made an excuse for unreasonable investment. With high pressure it is possible to use a much smaller factor of continuous service and provide for unusually high localized future demands by increased pressures.

Properly Determining Hourly Demand

The preferable method for determining the hourly demand is to secure actual figures from an existing and comparative district equipped with a district meter. The many variable conditions mentioned are reasons why meter readings taken in an existing district on an hourly basis are sufficiently accurate for comparative purposes. Where no meter exists the hourly demand on either individual streets or the whole territory can be closely approximated by dividing the total monthly sales in existing districts or streets by 240, the result being the cubic feet per hour maximum demand for the sales period. Dividing this result by the total number of meters whose readings were totalled to secure the sales in the district or on the street in question would give the hourly demand per meter per consumer. This method provides a readily obtainable figure with which to compare various types of streets of the same character if carefully selected. It has been found by this method and metering that the type of small closely grouped seasonal homes at beach resorts usually have a low demand, being five to ten cubic feet per hour. However, because of the number of consumers on a given length of main the actual total consumption is often equivalent to that found in the sections comprising much larger types of residences situated on estates with long distance between buildings. For this reason many companies use as a basis for computation and comparison consumptions per foot of main. To secure the consumption per foot of main it is necessary to use lengths of main, and the result is more variable and mostly smaller in numerical values than consumption per meter. Length being one of the factors in all flow formulae, the general use of consumption per unit of length requires additional calculation. While interesting to the engineer, consumption per unit of length has more value and understanding in commercial efforts and accounting practice. Keeping the number of consumers, demand per meter and length of mains separated, facilitates comparisons and computations.

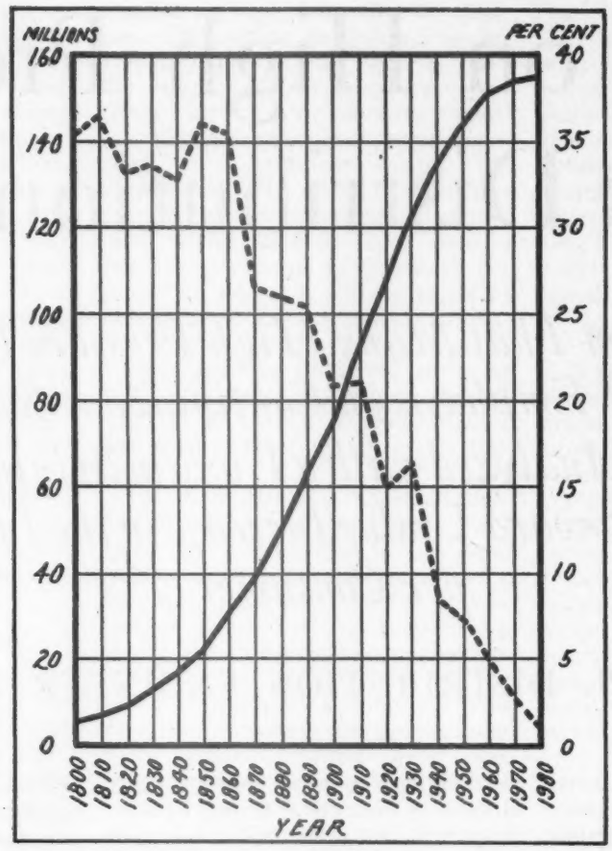
It is obvious from the numerous practical factors stated that additional intensive consideration of too many theoretical ideas tends to confuse judgment, therefore, study should be confined to securable comparisons. A thorough knowledge by the design engineer of the theory of diversity and ideal square mile systems on low pressure are useful to broaden vision rather than for mathematical calculations on a new system.

Five-Year Limit Specified

The tendency of loads in various territories, based on past experience in existing sections, should not be extended more than five years unless unquestionable reasons indicate that past experience will continue beyond such a period. A transmission line must be designed for ever increasing total quantities and long time periods but on distribution systems it will be found that the demand per consumer increases and decreases in varying cycles, and that once saturation of number of consumers is reached on individual streets, the peak demand per consumer will often have declining peaks as each cycle is repeated, or at least the rate of increase on the peaks will be slow. Exceptional conditions in a few existing territories. such as the advent of

natural gas, have temporarily created a rapid increase in both peak and average demand. Extending studies of past demands beyond a five year period may result in excessively high results, when the past five years used as a basis are on the increasing phase of the demand cycle. When records are available for more than five years past in existing territories and used as a basis for predicting the future, they should be studied as a means of determining what point in a cycle the recent years occupy.

Several studies conducted by American Gas Association Committees combined show that two-thirds of the distribution systems designed are on hourly consumer demands at the peak periods of 20 to 30 cubic feet. Above thirty cubic feet per hour maximum demand, actual records show only a few isolated cases, the highest of which was 84, while others reported 75.68 and 43.5. Judgment as to probable local requirements must be used in selecting a demand.



Curve of Population of U. S. in Millions and Percent Increases. Indicates in not far future increases in sales will depend upon shifts in population or additional consumption per consumer.

The quantities of gas required on the various mains may be secured by totaling the potential consumers and multiplying by the demand assumed. The result is not usually inserted in a flow formula and diameter or other factor left as the unknown to be solved for, but is used to compare with the quantity found by solving with mathematical values given to all factors but quantity.

Main Sizes—The formulae previously noted are all in a form which provides the greatest ease in solving for quantity which requires a knowledge or the assumption of all other factors. Experience simplifies the assumption of diameter, as an analysis of numerous high pressure distribution systems ranging from the smallest villages to large cities indicated that the two-inch size comprises from eighty to one hundred per cent of all mains, the one hundred per cent being in the smaller towns and the eighty in cities. A number of systems are existent where no sub-transmission main is needed due to the concentration of the territory, a single two-inch loop around the outskirts, double mains or numerous tie-ins providing sufficient capacity.

The prêdominance of two-inch as the minimum size has been the result of experience proving it to be preeminent as to strength, capacity as compared with 1¼" or 1", superior rigidity compared to the smaller sizes, facility with which services or mains may be connected by any of the common methods used compared to smaller sizes, the slight difference in installation cost between two-inch and one and one-quarter inch sizes, lessening of partial or complete stoppages, lower pressure possible, superiority of the longitudinal seam in butt and lap weld pipes over that in the smaller sizes and seamless pipe available at a reasonable cost. Eventually seamless tubing mill practice will be perfected and seamless pipe will be economically available in smaller sizes.

When two-inch size is insufficient, computations are made for the capacity of three-inch, four-inch, etc., without varying the other factors until the quantity determined is equal to or above that required, or, by substituting the desired quantity and solving for diameter. Should the pipe size found by solving for diameter result in a non-standard size the next larger standard diameter should not be arbitrarily selected without determining the quantity possible using the next lower standard size. Where the difference in quantities between the required amount and that furnished by the lesser diameter is small the extra expenditure for larger main may be saved.

Initial and Final Pressures—To provide the greatest economy, the maximum pressure drop should occur in the most common sizes of mains, as then full use of their capacity is obtained. The sub-transmission main is usually designed for a drop of only a pound or two when the initial pressure is approximately ten pounds. The distribution mains may then be allowed a drop of 3 to 4 pounds and still provide a minimum of five pounds at the service connections. After these assumptions are made each type of main should be checked for capacity. It is practically impossible to state the most economical distribution pressures, as all existing types have apparently proved their efficiency and have their advocates. In at least one large city designed for high pressure, low pressure is carried during off peak hours and just sufficient pressure during the peak hours to provide for the demand. With such pressure variations governors are necessary on all services to provide uniform pressure. The more common designs provide for a variation of from ten to five pounds between source of supply and services, the economical differences usually being found in the necessary compressing. In a territory which supplies but a single large city, the compressing of gas to ten pounds would be expensive and a lower range of pressures may provide the economical installation. Where small distribution units are served from transmission lines, practically any desirable pressure is generally available without additional compressing costs. In these cases it will be found that more uniform results occur by maintaining an initial pressure of ten pounds and a minimum final of five pounds than with the use of lower pressures.

An intimate knowledge of the transmission pressure conditions is necessary, where a transmission main is the only source of supply, before assuming the initial pressure, as un-

der peak load conditions the transmission line may carry a pressure below the minimum established for the initial distribution pressure. With the existence of such a condition the minimum size of main is seldom enlarged above two inches but the necessary carrying capacity is provided by larger sub-transmission mains or additional loops and tie-ins. Enlarging the diameter of the most common size of distribution mains is more costly than enlarging the comparatively short lengths of sub-transmission mains. A larger diameter sub-transmission main will decrease the pressure drop in that portion of the system, allowing the originally assumed drops to occur in the demainder of the distribution.

These pressure assumptions provide for proper service in the peak demand period of the year and during other seasons the lowest pressure consistent with service and safety is carried. Some companies provide a variable pressure, especially on converted systems, during each day, changing the limits of the pressures with the seasons. This pressure control is accomplished automatically by a loader device on the regulator which increases the outlet pressure as the demand increases.

An Important Factor

Relatively low pressures are advantageous in high pressure distribution but depend upon local conditions. If any leakage occurs in the mains the unaccounted-for gas decreases as the pressure is lowered. This is particularly important in systems converted from low to high pressure where the joints are of the bell and spigot type.

As the pressure decreases, the loss from blowing governors is minimized, although this is a minor factor in unaccounted-for gas as demonstrated by the little total difference between well designed and installed high and low pressure systems.

Lower pressures on the distribution system require less on the transmission, although usually a single distribution system does not affect long transmission lines from which any desirable pressure on the distribution may be secured. Where there is no transmission line, pumping costs are materially reduced by carrying the minimum possible distribution pressures.

On new systems the lower distribution pressure decreases the size of storage tanks, as their available quantity depends on the differential of pressure under which they may operate. On existing high pressure systems where storage was installed to feed the distribution at some particular pressure, any reduction of that pressure increases the available storage or allows the maximum pressure carried in the storage to be decreased.

Down to the minimum at which house governors will satisfactorily operate, lower pressures on the distribution system will increase the amount of valve action on the house governors, resulting in less foreign matter adhering to the governor seat and thus reducing the number of governor blows.

Weakness of Low Pressures

With too low distribution pressures there is the possibility that unexpected sudden demands over the system will be unprovided for, as the small mains used in high pressure distribution contains little available storage and demands must be provided from storage or directly from the transmission main. An additional five pounds on the distribution system does provide sufficient storage to decrease the sensitivity of the system.

The average service on the system will usually be of adequate capacity when lower pressures are carried on off-peak periods but large individual consumers are sometimes affected. Where varying initial pressures are carried during peak and off-peak hours the criterion of consumer service should be judged by checking pressure conditions at the house governors of the particularly large consumers, as a large drop in pressure may occur between the main and house governors yet not be evident on the charts recording main pressures at vital points.

By referring to the effect of inlet pressure on house governors given in a preceding section, the effect the desired pressure variations will have on the functioning of the governor may be determined.

There will be an increase in the velocity of the gas in the mains with lower pressures, resulting in added foreign matter carried which will affect house governors particularly and to a lesser degree meters and appliances.

Specific Gravity—In the original design only the gravity of gas to be distributed is usually considered. With the rapid changes taking place in the types of gas distributed it is good practice to check the figures of quantity in the original design with those obtainable with a heavier gravity gas. However, the design should not be materially changed to provide for a future heavier gravity gas without considering the effect on demand resulting from the higher B.t.u. value of the heavier gravity gases and possible lower cost. Many systems designed or redesigned in the past ten to fifteen years provided only for low gravity gases and now considerable capital must be invested to provide for the change to heavier gravity gas which is not always natural gas. In this case as in many others the flexibility of high pressure distribution readily allows increasing the pressures, if necessary, to offset other effects without any change in the quality of service to the consumer.

Systems are frequently installed for small sized villages using liquefied gas as the source of supply but planned to be eventually served from transmission lines. Higher pressures should be used on the initial system to offset the higher gravity, although often the lower cost of gas to the consumer resulting from connection to a transmission line often increases consumption so that higher distribution pressures will be required.

Length of Main Considerations

Length of Main—The source of supply and load locations on transmission mains are definite with a considerable distance between, and definite values for length are available for flow formulae. On distribution mains the load is not uniform both as to demand and distances between sources of demand. It is impractical to vary the size of main between each source of demand. Assumptions must be made with regard to the location of loads. The length is definite between sub-transmission main lateral take offs but the variation in load on each individual street is such that it would be impractical to assume a figure for demand at each of these load locations with which to compare quantities by computation. The loads, therefore, on both the sub-transmission and distribution mains are usually assumed as uniformly distributed along the total length. The length for substitution in formulae is then considered as one-half of the actual total length; this is not theoretically exact but it is practically so, considering the limits of error of all the assumptions necessary. One-fourth of the actual length is used in the formula where mains are fed from both ends, as it is assumed similar to two uniformly loaded mains of equal length.

(Continued in March issue)

Pension Notes for Gas Company Executives

In View of Mounting Pension Costs Such Matters as Levelling the Expense and the Desirability of Employee Contribution to the Pension Fund Are Timely

By E. C. McDONALD

Asst. Secretary, Metropolitan Life Insurance Company, in Charge of Group Annuities

EXPOSURE to the ideas expressed by a good many utility operation managers convinces me of their general feeling that the payment of Pensions to old, long service employees is good business. I, therefore, offer no argument for the *need* of pensions—the existence of so many definite Plans and actual payments each month to many thousands of retired employees speaks eloquently enough as to their usefulness.

Nevertheless, a brief resume of how Pension practice usually gets started may be of interest. As typical of practically all such plans let me present briefly the origin of the Plan now in effect in an eastern gas company as recited by the Board Chairman not long ago. For obvious reasons the names are fictitious.

A Typical Case

"Back in 1914 I was made General Manager of the Tydesdale Gas Company. One morning, shortly thereafter, the Superintendent of our plant at Knightstown came into the office and told me that old man Doyle was no good, that he wasn't safe and really was too old to work.

'Can't you give him an easier job and keep him on the payroll a while?' I asked.

'I don't see how, because our easy jobs have run out and then some,' reported the Superintendent. 'We've had cases like Doyle before and can't find a watchman's place or any job for this man.'

"Since there were no easy jobs to be had, for the moment at least, it brought me sharply up to the question of whether this old man ought to be let go without any further delay. I expressed such an idea to the Superintendent and he promptly rebelled against any thought of letting Doyle go without some financial provision saying he knew Doyle was practically without income except for his weekly pay envelope.

Discharge Means Poorhouse

"In my experience, it's no good telling men like Doyle that they should have been thrifty and that the Company doesn't owe them a living after they are too old to work. The fact remains their pay is all they have—if you discharge them, it's the poorhouse.

"Now here's the trouble with telling him he's through. He is well thought of by our employees, he has been with the Company *many* years, and to discharge him now when he is too old to get a job elsewhere wouldn't help us much in the community. Customer good will as well as employee morale must be preserved, so we allowed him $60 per month and told him to go home and take a much deserved rest. It seemed the wisest course.

"That's about the story of how we embarked on Pension payments." And that story fits the beginning of many such pension plans.

Talk to utility executives and you will find that they would all be most reluctant to give up their Pension Plans. They emphasize the Retirement allowance as the one efficient and practical course to follow. An inquiry addressed to officials of a number of public service organizations brought forth a substantial list of reasons justifying the payment of a Pension Plan. In maintaining that a retirement allowance is good business, six reasons stood out most frequently in the replies received. Here they are:

Six Good Reasons

1. *Actual Savings in Payroll*
   This saving appears to come about through the fact that certain retired employees are not replaced, —their work being absorbed by the rest of the organization.
2. *Increased Efficiency Per Individual Employee*
3. *Stimulation in Various Departments*

Several executives point out that through their Pension Plans they have been able to hold young, promising employees because these young men knew they would have an opportunity at higher positions when certain officers, because of

age would be placed on the retired list.

4. *Enhancement of the Firm's Reputation*

The majority of those commenting on the justification of a Pension Plan gave the reason that the Company's reputation as an employer in the community was improved through the operation of a Retirement Plan, with a consequent favorable effect on the labor market.

5. *Better Morale in the Organization*

Some officials write "It would be a great mistake to discharge an old man of long service without financial provision, because it would affect unfavorably the morale of our employees."

6. *Employees can Look Forward to Security In Old Age*

When a definite Pension Plan exists, an employee can so adjust his scale of living during the years immediately preceding retirement to meet the amount of income he knows he will receive at that time. To suddenly ask a man at an advanced age to take a pension of one-half or one-third of his current income is an abrupt shock that can be avoided by a definite plan.

Employee Participation — There seems to be rather general agreement that it is highly desirable to invite an employee to contribute toward the income he would receive when he is too old to work. Many employers report that employee benefits of any type, be they Group Insurance, Sickness and Accident or Retirement allowances, are more appreciated, better understood and more apt to accomplish the purpose if the employee shares in the cost.

For the last three or four years well over ninety per cent of all the new Retirement Plans established in this country and Canada were on a contributory basis and, in addition to these new plans, a number of older non-contributory plans were revised to provide contributions from the employees. In all cases, employees were found ready and willing to join the employer in building up a fund for Old Age. Some examples of plans where the employees contribute to the cost of their retirement income are—Rochester Gas & Electric Corporation, Cleveland Railway, Central Hudson Gas & Electric, Los Angeles Gas & Electric, Southern California Gas Company, Kansas City Power & Light, and Southern Counties Gas Company. Needless to say the introduction of employee's contributions has an important bearing on the employer's total outlay.

Pension Reserves—It seems appropriate at this point to examine the fundamental principles behind pension reserves. As public utilities saw rapidly rising annual disbursements for Pensions, they naturally began to consider methods of leveling costs. It was then that there came recognition on the part of these managements that the replacement of employees, whose usefulness is impaired by old age or infirmities, parallels the replacement of worn-out plant equipment.

The fact that the pension cost curve has risen so sharply in many concerns lies principally in the lack of recognition up to a comparatively few years ago, that the items of depreciation of equipment and depreciation of the human element are, for accounting and financial purposes, parallels.

For example, today we see the Yorkville Gas and Electric Company setting up reserves against the replacement of plant and equipment. That's sound accounting. And the financial officers of the Yorkville Gas Company insist naturally that it is a necessary and correct procedure in order to know the true financial picture of the business.

Now the Yorkville Gas Company has a considerable number of long service employees who eventually will reach an age where efficiency will demand their replacement. It cannot afford to assume that its or-

PERIODIC PERSONNEL REPORT ON OLDER EMPLOYEE

(For use of major executive during interview)

Name..... Age 45 50 55 60 65 70 75 80 85

Department..... Present job.....

SUPERVISOR'S REPORT

Attendance *Regular*.... *Considerable absence*.... Attitude *Cooperative*.... *Neutral*.... *Non-cooperative*..

Quantity of work..... Quality..... Change in quantity and quality during past year.....

Time lost due to lack of work?..... Employment prospects during next five years.....

If a transfer is necessary, on what jobs can he perform up to par?.....

What new jobs, if any, can he learn?.....

What advice can the executive give to help the employee maintain or increase his usefulness to the company?.....

Supervisor's view of his personal and family financial needs, in case of retirement.....

PERSONNEL DEPARTMENT REPORT

EMPLOYEE

Age..... Length of service with company..... Education.....

Present earnings per year..... How long at present rate?.....

Amount of savings accounts..... Investments..... Real estate..... Life insurance.....

Previous jobs in company.....

Previous jobs elsewhere.....

Predominant characteristics.....

Health prospects for next five years with reference to par performance—doctor's version.....

Suggestions for a change of occupation, if any.....

Suggestions for counsel to employee (health, work, finances, etc.).....

Suggestions for savings (or insurance) plan adequate for retirement at age 65 (or earlier if retirement is likely to be earlier).....

FAMILY

MEMBERS	AGES	OCCUPATIONS	HEALTH	EDUCATION
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

REPORT ON INTERVIEW

EMPLOYEE'S VIEWS

Personal Health.....

Present and future capacity for present job.....

Other work he can do well.....

Financial Status.....

Future Plans.....

EXECUTIVE'S NOTES

COMMENTS

MEASURES AGREED UPON WITH THE EMPLOYEE AND INSTRUCTIONS FOR CARRYING THEM OUT

Signature of Executive.....

Date.....

Front and Back of Personnel Report Form. From "The Older Employee in Industry," Published by Metropolitan Life Insurance Company

ganization is young and fresh and that it has no pension liability. The mere fact that pension costs have been handled on a supplementary payroll basis does not disguise the fact that reserves should be set aside annually for the replacement of the older, disabled employees. Mergers, unsympathetic future managements, obsolescent products may make these reserves doubly important.

When for efficiency's sake the old employee must be dropped, the fund from which his retirement income would be paid should be in hand—the result of appropriate charges against the cost of service during that employee's active working lifetime.

Perhaps we can best illustrate our point by some simple pension arithmetic! Suppose the utility decides to grant a pension of $60 a month for life beginning at the age of 65. If the company pursues the old-fashioned method of paying it out during the balance of the employee's lifetime, it will, on the average, pay this amount for approximately 12½ years (the average expectancy after age 65). Thus the Company will have a total outlay of approximately $9,000.

But, suppose the modern method of establishing reserves each year during the employee's active working lifetime is adopted. In this case, the employee's contributions together with the effect of compound interest will reduce the employer's total outlay to only $2,400.

A Typical Plan

An outline of a Retirement Plan that has proven effective and is working satisfactorily in a number of properties may be of interest.

Here are the highlights of such a Plan:

1. *The normal retirement age is 65 for men and 60 for women*

65 was not arbitrarily selected by any means. As a matter of fact actual experience in a great many concerns indicates that 65 is just about the threshold of old age and that after 65 the rate of sickness jumps up very rapidly and the possibility of accident is present in a much greater degree.

While these ages are used for normal retirements the matter is entirely flexible and the management of the company may retire an employee earlier or later than the normal retirement age, as best fits the individual case. The setting up of a definite age, however, helps the employee to plan on a definite time of retirement and enables the employee and the employer together to build up reserve adequate to provide the retirement income at that time.

2. *The Amount of Retirement Income*

The usual amount of pension suggested is 1½ per cent of pay for each year of service while the employee is a contributor to the Plan. The usual system is to have the employee and the employer jointly purchase each year, a retirement income unit (in reality a deferred annuity if insured), equal to 1½ per cent of pay for that particular year. In this fashion there is purchased and definitely segregated each year to work at interest, an annuity unit that becomes due and payable at the age of retirement. It will be evident, therefore, that at the end of a period of 35 years membership in such a plan, an employee would have 35 units, each equal to 1½ per cent of his pay during each of his years of membership.

In other words, an employee joining the plan at age 30 and retiring at 65, would have 35 times 1½ per cent or 52½ per cent of his average pay received during membership in the plan.

Allowing for Past Service

Credit for past service, that is service rendered prior to the adoption of the soundly financed contributory plan, has in many instances been fixed at 1 per cent of present pay, multiplied by the years of completed service up to the time the new plan was made effective. In other words, an employee having already completed 30 years of service would be credited with 30 per cent, for example, of his 1933 earnings. However, because 1933 was in most cases, a considerably lower year from an earning standpoint, some employers might prefer to take the average for the last five years.

3. *The Amount of Employee's Contribution*

Employees deposit 3 per cent of pay by payroll deduction each month. This 3 per cent goes to the purchase of an annuity unit as described above. It should be clear that the contribution of 3 per cent together with the employer's contribution, buys the 1½ per cent annuity unit. But this annuity unit is not payable for one year, but if retirement takes place at age 65 it is payable on the average, for 12½ years—12½ years being the expectancy of life after age 65. In other words, for each 3 per cent contribution by the employee he may expect to receive, on the average, more than 12 times 1½ per cent annuity unit as a retirement income.

When Interest Is Allowed

The employee's contributions are always returnable in full in case he leaves the service, or to his benficiary in the event of death. Arrangements can be made to allow a reasonable rate of interest credit on the contributions when withdrawn. Even in the case of death after retirement but before the employees have received the total amount of contributions in annuities, the difference is payable to the beneficiary.

4. *Eligibility*

Usually these retirement plans invite employees to become members upon the completion of one year's service. This seems highly desirable for several reasons:

(a) The employee commences his contributions at an early age so that a reasonable and effective amount of retirement income may be built up by the time he reaches age 65.

(b) It is important to enlist the cooperation of the employees as early as possible in order to make the plan *general* for the entire working force.

(c) A waiting period of one year eliminates the bulk of the turnover of the average organization.

5. *The Employer's Reserve*

Naturally an actuarial survey is necessary to show the amount of reserve necessary each year to satisfactorily finance such a plan in cooperation with the employees, and proper computations can only be made when the age, pay and length of service of the employees of a particular organization is known. From an examination, however, of the personnel data of a great many organizations, including a number of utilities which have a long corporate history, it is fairly safe to say that so far as future service is concerned, the corporation should add to the contributions of the employees to finance the plan just mentioned above, approximately 2.7 per cent of payroll. Whatever additional amounts were necessary over a period of years to gradually liqui-

(Continued on page 36)

Notes and Trends of Gas Advertising Today

Despite the Contention That the Woman Influences a Very Large Percentage of the Purchases for the Home and Family, It Is Suggested That Gas Companies Pay More Attention to Directing Their Advertising Toward the Paterfamilias

By THE COPYWRITER

WHILE everybody is doing one thing, it is a good idea sometimes to take the opposite course. The main caution in adopting this procedure is to be sure that your action is well grounded in human psychology and that it does not attempt to oppose current social and economic trends. To be successfully "different" under these limitations is not quite so difficult as it sounds, however, since it is well known that everything has at least two sides.

Getting down to brass tacks, I simply want to say that it is high time our advertising men were reminded that they have been overlooking, in their copy and campaigns, about fifty per cent of the average gas company's customers, which fifty per cent represents, from some standpoints, a most important half. I am referring to the half that wears long pants.

The gas industry was very early "sold" on the theory that women influenced, if they did not actually consummate, the sale of gas-using appliances. This was even before there were any statistics on the subject. After the War, every other industry became woman-conscious until even the advertising of heavy machinery appeared to visualize a purchasing agent of the feminine gender. Quite recently, the president of a large refrigerator company was quoted as follows in a widely circulated business publication:

"Better than 2,000,000 women cast their votes at the shopping centers of American business every day. They control the purchase of 62 per cent of all hardware, 85 per cent of all drugs and sundries, 90 per cent of all automobiles, 98 per cent of all household appliances, 97 per cent of all groceries, 77 per cent of all sporting goods, and actually 61 per cent of all men's furnishings.

"Feminine influence is the big factor in all successful electric refrigeration merchandising.

Gas—
as INEXPENSIVE as a DAILY SHOE SHINE
SOME families pay less than $1.00 a month for Gas service; others use $6 or $7 worth of service per month. But the average Gas bill is less than 10 cents a day—less than the cost of a shoe shine.
IT IS wise to use Gas appliances in Milwaukee, because Milwaukee enjoys one of the lowest rates for manufactured Gas of any major city in the United States...
after all GAS IS BEST
Milwaukee Gas Light Company
626 E. Wisconsin Avenue
Phone DAly 6720

This Ad Brings the Bill-Payer Into the Picture

I have no idea where these figures came from; but I have seen similar ones, most of them well-authenticated by experts in the art of customer surveys. They must mean something. They must have some basis in fact. But nevertheless and notwithstanding, my mind refuses to believe in the picture here inferred of an acquiescent and largely passive man-person, magnified to represent the American Male, who permits his wife to buy or "control the purchase" of all but a paltry two per cent of the household appliances sold in this country. There may be women who dream of such Utopias, but you and I know that it doesn't happen that way in any household of which we have had personal or intimate knowledge.

Too Much Concentration on Women

The influence of women in regard to purchasing power is not to be denied. It is considerable and, in some directions, may even be greater than an equal division would allow. But there is no reason that I can see—and I think we have been missing some bets as a result—for the almost complete concentration on the so-called "homemaker" as indicated by gas company advertising during the past generation or more.

Therefore, I have been looking for quite a while for some sign that would show that the gas industry is becoming aware that it has anything to talk about or sell that is likely to interest the man-about-the-house. A well known magazine reminds us that "Behind every woman stands the shadow of a man." Not only does the man influence many of his wife's personal purchases, including her hats but we are even willing to bet that he casts the deciding vote when it comes to installing a gas-heating system or an automatic water heater.

The excuse for this article at this time is that I believe I have found the signs I was looking for in the latest grist of adverting proofs submitted by some of the more progressive utilities. If I am not mistaken, there is a perceptible note of chest tones here and there. It is a happy thought that we may eventually reach the fellow who foots the bills, for installment payments as well as for gas.

The frank sexology of the Greater Boston campaign, which decorated these pages in December, was certainly set to catch the roving eye. It has not been duplicated elsewhere as yet; but in its stead we have the virile and striking testimonial of the Milwaukee Gas Light Company in what appeals to me as one of the outstanding advertisements of the year—"MEN WHO KNOW". It starts with an illustration, in crayon, of the type of man you would like to meet. Then it proceeds directly to say:

"Well informed executives and heating engineers in all classes of industries choose gas for the kitchens of their own homes. They consider no other type of stove equal to the modern Gas Range—either for economy or service. An informal survey of the homes of executives and engineers of public service companies which serve communities with both gas and electricity shows that nearly all these men use gas for cooking. They know that gas is the cleanest, safest, fastest and most economical cooking fuel in the world."

Cooking! Of all things to talk about to a man! Yet, it is no guesswork to suppose that a large percentage of men in Milwaukee not only read this advertisement (a little flattered, perhaps, that the gas company was talking their language on such an obviously domestic topic), but also stopped to do a little constructive thinking on their own account about the relative merits of gas and some of the other competing fuels.

Another Masculine Slant

Another masculine note is sounded by the advertising of the Community Natural Gas Company of the Lone Star Gas System. Here the slant is institutional, but it also has a promotional purpose. The headline is challenging: "Men Who Got Up Before Daylight Guaranteed Your Heat for Tonight". It tells the story of the scores of men—gas company employes—who get up before dawn every morning to assume their posts at the wells, compressor stations and along the pipe lines "guarding your gas service every step of the way to keep it dependable". It makes the necessary contrast with the comfortable householder who rises in a warm house and takes automatic heating for granted. It takes a man to appreciate what this means.

My peeled eye lights on a pair of straight house-heating advertisements—one by the Consolidated Gas Company, the other by the St. Louis County Gas Company, both directed at men. In the first instance, we see a substantial citizen, stroking his chin over the newspaper forecast: "Colder Tonight!" he says. "That'll be the second time I've had to build the fire this week." The main caption reads, "No Trouble When the Temperature Changes . . . . If You Heat with Gas, the Most Flexible Fuel." This copy was obviously not designed for mid-winter; but it was probably most effective at the beginning of the heating season.

The Right To Squawk

In St. Louis they ask, "Did You Read What H. I. Phillips Said About a Husband's Right to Squawk?" Phillips is a popular newspaper columnist who has done his part by setting up a code for coal users. Among other provisions, he specifies "that the husband shall have a right to squawk should he get up, go down to the cold cellar, dump the ashes, pile in new wood and then discover that the box of matches he always kept on the ledge is missing." The advertisement adds—"Folks who live in gas-heated houses don't know the meaning of 'furnace cares'!"

If there is any doubt about the possibility of interesting men in gas company advertising, it is completely resolved by the holiday advertising that appeared recently over the signature of the Westchester Lighting Company. It must have been hard to resist the smile of the freckle-faced boy in the photographic illustration, and harder still for the head of the household to ignore the headline appeal: "You Bet I'm Glad Dad's Buying an Automatic Refrigerator This Christmas!" There was also a footnote about installment terms with the sub-heading, "Timely tip to fathers."

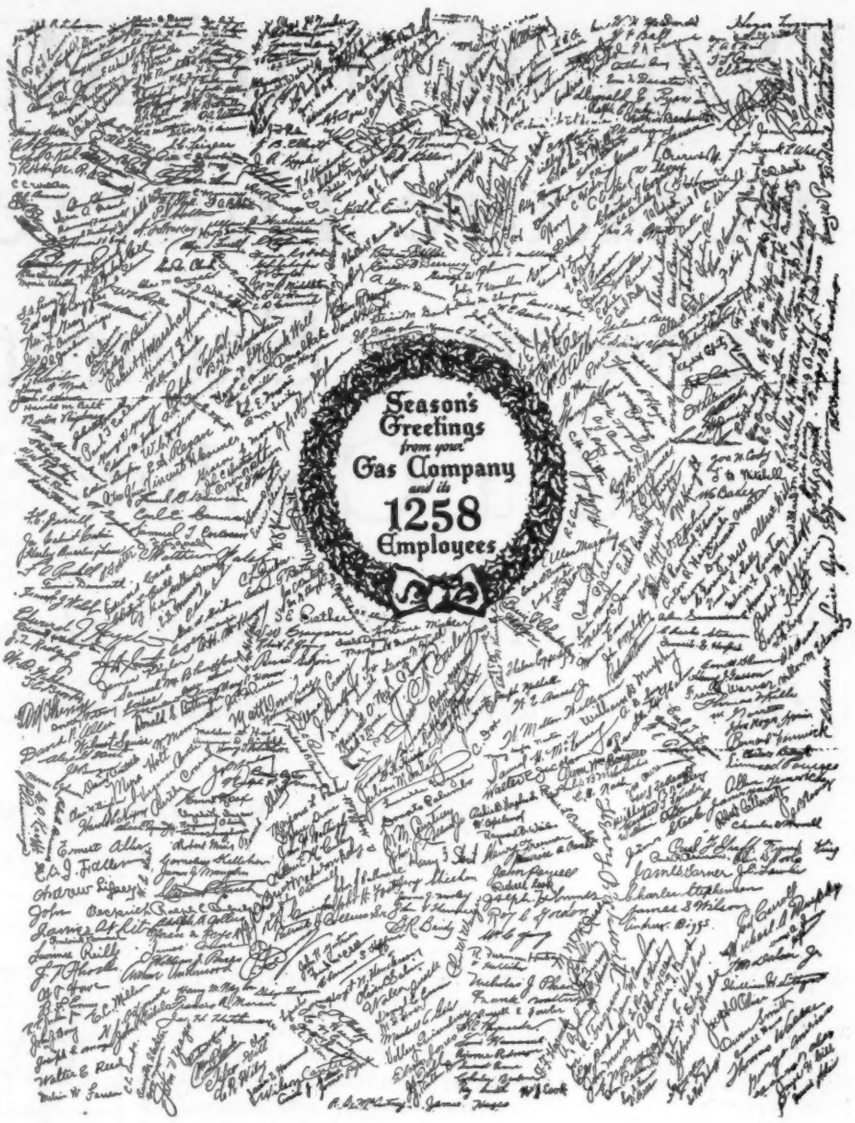
Even where the feminine influence is still dominant, one may now observe an effort at balancing the scale. For example, the Peoples Gas Light and Coke Company started off their house-heating campaign in Chicago with the pathetic figure of a female stoker made popular by the national

slogan of several seasons ago, "A Shovel Was Never Made to Fit a Woman's Hand", which advertised oil burners. But they adopted a masculine tone in the headline—"Man, Put A Stop To This". And, during the second week, they replaced the lady with a figure of a man absorbed in the same occupation, thereby engaging the attention of both members of the household. ("Gas Heat Ends This Early Morning Firebuilding").

That strikes us as intelligent advertising. So was one of the suggestions of the A. G. A. Copy Service which depicted a real he-man in the cap and apron of a nurse under the appropriate message—"Resign as Nursemaid to the Furnace!"

The same quality of compromise that was so smartly demonstrated in Chicago is also shown in the cost-of-gas advertising carried on by Milwaukee, where so much original thinking in gas company advertising has recently come from. In one advertisement we read, "Gas Service As Inexpensive As Your Ice Cream Sundae" with a dainty handful of polished fingernails poised gracefully over the fudge-and-cherry. In the second we learn, "Gas As Inexpensive As A Daily Shoe Shine" with a sturdy looking pair of mannish brogues. It always pays to bring the bill-payer into the picture.

I was going to close on that note, feeling that the reader by this time was either convinced or exhausted. I am asking the printer to leave the forms open just another minute, however, or long enough to thank the Washington Gas Light Company for sending me one of the most novel gas company newspaper advertisements of the season. It is nothing less than a seven-column spread reproducing the actual signatures of—well, here is the heading:



How the Washington Gas Light Company Said "Merry Christmas"

"SEASON'S GREETINGS FROM YOUR GAS COMPANY AND ITS 1258 EMPLOYEES"

They're all there . . I counted 'em!

Summary of Gas Company Statistics for November, 1933

SALES of manufactured and natural gas aggregated 108,671,800,000 cubic feet in November, an increase of 5 per cent over the corresponding month of the preceding year.

In spite of augmented sales however, revenues continued to lag, income for November amounting to $57,631,300 as compared with $58,929,500 in November a year ago, a decline of 2.2 per cent.

Most of the sales expansion of the industry was the result of pronounced increases in gas sales for industrial-commercial purposes, which averaged 11 per cent above the figures for November a year ago. Revenues from this class of business also gained, although not in proportion to increased volume, amounting to $16,849,300 in November as compared with $16,412,200 for the same month of the preceding year, an increase of 2.7 per cent.

While sales of manufactured gas for domestic cooking, water heating, refrigeration, etc., continued to run about 4 per cent below a year ago, sales for house heating purposes registered a sharp gain amounting to more than 44 per cent over the preceding year. Manufactured gas sales for industrial-commercial uses were also above those of a year ago by 6 per cent.

Natural gas sales for domestic uses during November were nearly 6 per cent below those of a year ago. Sales to ordinary industrial customers however, were up nearly 13 per cent, while sales to large scale industrial users of natural gas showed a gain of more than 26 per cent over the same month of the preceding year.

—Paul Ryan, A. G. A.

Derivation of Mean Temperature Difference Between a Saturated Gas and a Cooling Liquid

It Is Shown That the Method Heretofore Used for the Determination Is in Error and a New Method Is Presented

By SYBREN RUURD TYMSTRA

Instructor in General Engineering, University of Washington

MEAN temperature difference, in condensation, may be defined as that temperature difference at which, if it occurred over the entire area of contact, the total transfer of heat per unit of time would be the same as the summation of the transfers of heat of the elementary areas at their various temperatures during the same unit of time.

In this article it will be demonstrated that the method hitherto used for the determination of the mean temperature difference between two fluids is incorrect, if the fluid to be cooled is a saturated gas. A new method for calculating the mean temperature difference for such conditions will be evolved. Although the characteristics of saturated gas preclude absolute accuracy, the result obtained by means of this new method will be shown to approximate the true mean temperature difference more closely than that obtained through the use of any method previously in use.

As a brief introduction, consider the heat transfer between two liquids of different temperatures in either parallel or counter-current flow. This heat transfer is a function of various factors. It is, for instance, proportional to, (1) the temperature difference of the liquids, (2) the area of contact, and (3) the time of contact. Figure 1 is a composite set of curves showing the relationships between the two liquids as plotted to different ordinates. The first set of curves, comprising the solid lines, are plotted with temperatures as abscissas and heat content as ordinates. Line *ac* represents the liquid being cooled. The cooling liquid is represented by line *df* when the two are in parallel flow and by line *gi* when in counter-current flow. The quantity of the liquids in each case is the amount required to produce these lines. Since a heat balance exists at any abscissa and since the curves are straight lines when plotted as described, the mean temperature difference would be the arithmetic mean, if this condition could exist in a condenser. Such, however, is not the case; the length of contact area, and thus the time function, has not been taken into account. Heat exchange being proportional to the temperature difference existing at any elementary contact area, more heat will be exchanged per unit area in unit time at regions of large temperature differences

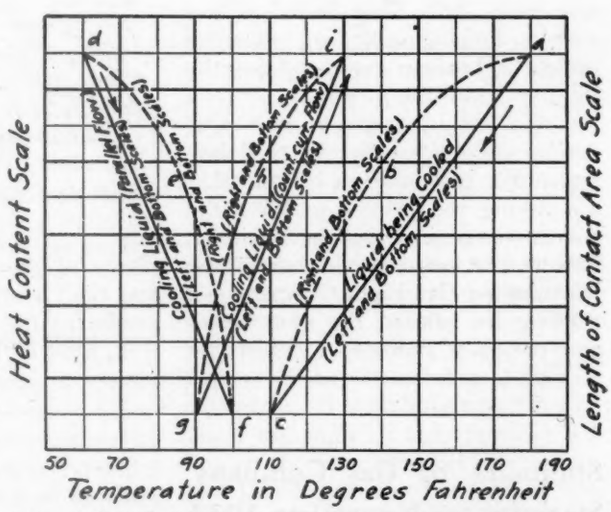


Fig. 1.—Relationship Curves Showing Temperature Difference for Liquids in Parallel and Counter-Current Flow.

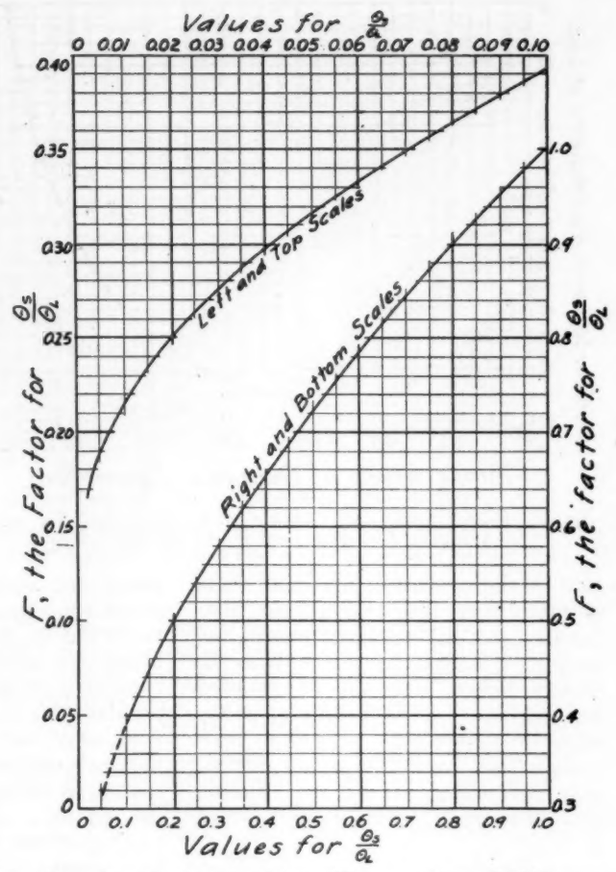
Portion of Bulletin No. 72, issued by University of Washington Engineering Experiment Station, Dec. 1933.

$\frac{\theta_s}{\theta_L}$	F	$\frac{\theta_s}{\theta_L}$	F	$\frac{\theta_s}{\theta_L}$	F	$\frac{\theta_s}{\theta_L}$	F
0.0025	0.166[a]	0.110	0.405	0.230	0.526	0.450	0.690[f]
0.005	0.188	0.120	0.417	0.240	0.535	0.500	0.724
0.010	0.215	0.130	0.429	0.250	0.544	0.550	0.756
0.020	0.251[b]	0.140	0.440	0.260	0.552	0.600	0.786
0.030	0.277	0.150	0.450	0.270	0.560	0.650	0.815
0.040	0.297	0.160	0.460	0.280	0.568	0.700	0.843[g]
0.050	0.316	0.170	0.464[d]	0.290	0.576	0.750	0.870
0.060	0.334	0.180	0.479	0.300	0.583	0.800	0.898
0.070	0.350	0.190	0.489	0.325	0.602[e]	0.850	0.925
0.080	0.365[c]	0.200	0.499	0.350	0.620	0.900	0.950
0.090	0.379	0.210	0.509	0.375	0.638	0.950	0.975
0.100	0.392	0.220	0.518	0.400	0.655	1.000	1.000

For the rectangles a, b, c, etc, the arithmetic mean would be 200, 100, 50, 25, 10, 5 and 1% too large

θ_{log} = Logarithmic Mean Temperature Difference
θ_s = Smallest Temp. Diff. θ_L = Largest Temp. Diff.
$\theta_{log} = F\,\theta_L$, in which "F" is a Factor for $\frac{\theta_s}{\theta_L}$.
(Hausbrand corrected)

Table 1.—Factor Tabulation for Logarithmic Mean Temperature Difference Determination.



θ_{log} = Logarithmic Mean Temperature Difference
θ_s = Smallest Temp. Diff. θ_L = Largest Temp. Diff.
$\theta_{log} = F\,\theta_L$, in which F is a Factor for $\frac{\theta_s}{\theta_L}$

Fig. 2.—Factor Curve for Logarithmic Mean Temperature Difference Determination.

than at regions where the temperature differences are smaller. Changes in temperature of the liquids will therefore occur more rapidly in the former regions than in the latter. Consequently, when plotted with ordinates representing length of contact area (and thus being a function of time) the curves cannot in general be straight lines. This is true for both counter-current and parallel flow. The true condition is illustrated in Figure 1 by the dotted curves which are plotted (relative to scale only) with the same temperatures as before as abscissas, but with length of contact area as ordinates. The liquid being cooled is now represented by curve *abc*; the cooling liquid, by curve *def* when in parallel flow and by curve *ghi* when in counter-current flow.

It is demonstrated in the literature[1] that the true mean temperature difference, when both fluids are liquids, is the logarithmic mean temperature. Its mathematical expression is:

$$\theta_{log} = \frac{\theta_L - \theta_s}{\log_e \frac{\theta_L}{\theta_s}}$$

in which

θ_{log} = Logarithmic mean temperature difference

θ_L = Largest end-temperature difference

θ_s = Smallest end-temperature difference

Hausbrand[2] has tabulated from this equation a set of factors by means of which the same results are obtained. These factors are shown in tabulated form in Table 1 and graphically in Figure 2. Slight numerical errors in Hausbrand's table have been corrected.

The true mean temperature difference is not so readily determined when the fluid to be cooled is a moisture-saturated gas. The heat content of such gas at various temperatures is not now directly proportional to its temperature. The latent heat of vaporization of the moisture contained in such gas constitutes the major part of its heat content. That moisture content varies disproportionally to changes in temperature, can be seen in Figure 3, which shows the moisture content of anv saturated gas plotted at various temperatures. Consequently equal changes in gas temperature do not result in equal changes in the heat content of such gas. Figure 4 is a modified heat content curve for saturated gas at various temperatures. This is not the true heat content curve for such gas; a slight deduction has been made equivalent to the heat content of the condensate, removed from the gas in any apparatus used to condense such gas, as for instance multipass tubular condensers. It illustrates the unequal heat distribution throughout the shown temperature range. Thus it follows that the logarithmic mean temperature difference is not the true mean temperature difference when the fluid to be cooled is a saturated gas.

A new method for such conditions has been proposed by Haug and Mason[3]. In this method, a graphical or analytical temperature survey is made as follows: At equal temperature intervals of the cooling water the heat balance and therefore the corresponding gas temperatures are determined. The temperature differences between gas and water are then determined at these equal water temperature intervals. The average or arithmetic mean temperature difference is then calculated by the trapezoidal rule, and this result is taken as the true mean temperature difference.

This method is thus analoguous to that illustrated by the solid lines of Figure 1. If plotted according to this conception the abscissas would represent temperatures, the ordinates the heat contents, and the cooling water heat content curve would plot as a straight line. This method is thus in serious error in that it does not take into account the loca-

[1] *Badger: Heat Transfer and Evaporation.*
[2] *Hausbrand: Evaporating, Condensing and Cooling Apparatus.*
[3] *American Gas Assn.: 1925 Convention, Report of the Committee on Condensing and Scrubbing.*

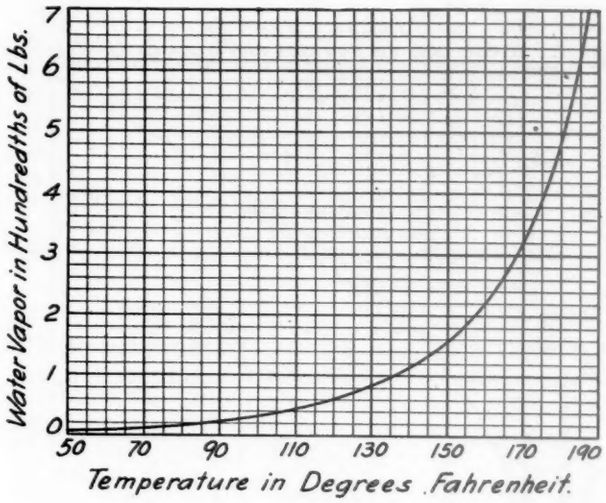


Fig. 3.—Water Vapor per Cubic Foot of Saturated Gas at Standard Conditions of 60° F. 30" Hg.

tion in the condenser at which these temperatures and temperature differences occur. In other words, the length of contact area and thus the time function has not been taken into account. This, however, is absolutely essential, as has been brought out in the previous discussion pertaining to the two liquids and illustrated by the dotted curves of Figure 1.

Considered from another angle: The magnitude of the heat exchange at any elementary area of contact is proportional to the temperature difference there found. At regions of large temperature differences the two curves tend to approach each other at a greater rate than at regions of smaller temperature differences. In other words, for an equal quantity of heat to be transferred per unit of time, less contact area is required when the difference in temperature is great, than when this difference is small. It can thus be seen that any graphical representation must be made with ordinates representing temperatures and length of contact area parallel to the flow (the latter being equivalent to a time function). Curves plotted as described will show the true condition. Their slopes at any ordinate will be a function of the length of contact area in respect to temperature difference. Since these temperature differences vary, it follows that the curves cannot be straight lines and that the mean temperature difference cannot be the arithmetic mean. The Haug and Mason method is therefore proved to be in error.

Unfortunately, owing to the complexities of the heat content curve for saturated gas, no accurate method is available for the determination of the mean temperature difference when the fluid to be cooled is such a gas.

The new method, here presented, gives the nearest approximation to the true mean temperature difference between a saturated gas and a cooling liquid.

For the purpose of examination let it temporarily be assumed that the heat content of the saturated gas is proportional to the changes in temperature. In Figure 5, a straight line *ac* drawn through given gas end-temperatures in the curve *abc* representing the heat to be extracted by the cooling liquid, illustrates this assumption. The counter-current method of cooling is used in tubular gas condenser practice; therefore, only the cooling liquid line *df* for such method of cooling is shown in the figure. The quantity of the cooling water is the amount required to be in heat balance with the line *df*. The mean temperature difference between the cooling liquid line and the assumed gas line can now be calculated. Either the logarithmic formula or its factor method may be used for such calculation. A graphical representation can readily be made by changing the ordinates from a "heat content" scale to a "length of contact area" scale. The assumed gas line *ac* and the cooling water line *df* change correspondingly to curves *agc* and *def*, respectively, as shown (relatively to scale only) in the figure. The mean of the abscissas between these curves is the calculated logarithmic mean temperature difference.

The temperature differences between the assumed gas line *ac* and the true gas curve *abc* must yet be taken into account. The over-all mean temperature difference therefore will be the logarithmic mean between *ac* and *df* (which is the abscissa mean between curves *agc* and *def*) plus the true mean between line *ac* and curve *abc*. The latter is impossible to determine accurately, but must be less than the arithmetic mean between *ac* and *abc*. These temperature differences must also be plotted with "length of contact area" ordinates. There, also, greater heat transfer will take place at regions of large temperature difference than at regions of smaller temperature difference. For the purpose of examination let it be assumed that line *ac* and curve *abc* are divided at the point of greatest temperature difference, say at *b* and *h*. Let the curves *ab* and *bc* temporarily be replaced by straight lines *ab* and *bc*. This procedure is not strictly sound; neither is it known at which place in the condenser these temperatures oc-

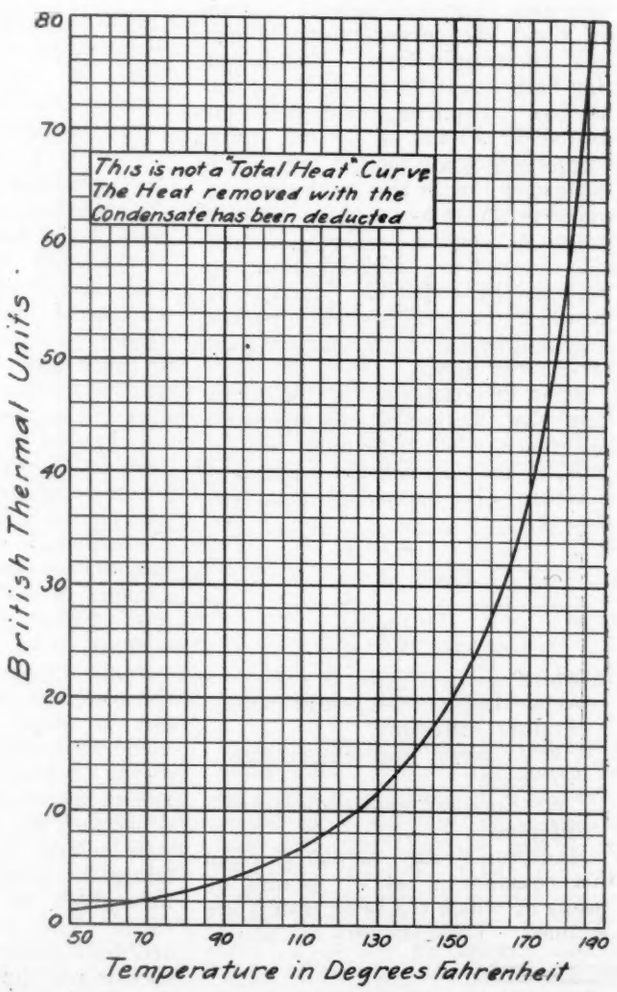


Fig. 4.—Heat to be Removed per Cubic Foot of Saturated Gas by the Cooling Liquid in Multi-pass Tubular Condensers.

cur. It indicates, however, that the mean between lines *ah* and *ab*, and between *hc* and *bc*, would tend to be the logarithmic mean. The relationship of the lines in each pair to each other suggests that the value of this logarithmic mean could not possibly be more than one-third of the arithmetic mean, since one end-temperature difference is zero. The mean temperature difference between lines *ab*, *bc* and curves *ab*, *bc* must yet be added. This value is rather small, certainly not over one-half the previous value or about one-sixth the arithmetic mean. It may thus be reasoned that the approximate value of the true mean between line *ac* and curve *abc* is in the neighborhood of one-half of the arithmetic mean. This empiric value added to the logarithmic mean of the end-temperature differences will give the nearest approximation to the true mean temperature difference between a saturated gas and a cooling liquid.

The expression is

$$\theta_m = \theta_{log} + 0.5\ \theta_{ar}$$

in which

θ_m = True mean temperature difference

θ_{log} = Logarithmic mean temperature difference

θ_{ar} = Arithmetic mean temperature difference between a straight line connecting the gas end-temperatures, and the gas heat content curve.

It might be asked: Why not draw straight lines *ab* and *ac* to begin with, find the two logarithmic means between these lines and the corresponding parts of line *df*, average the results, and add as an increment the comparatively small value of the mean between lines *ab*, *bc*, and curves *ab*, *bc*. This cannot be done, as it is not known at which place these temperature differences occur. The "length of contact area" for which each value so found would be the mean, is not known. Consequently the true mean cannot be so found. In other words, the error which of necessity occurs in the determination of the mean between line *ab*, *bc* and curves *ab*, *bc* would be extended over the entire temperature difference range.

Comparison of the Haug and Mason method with the new method discloses several points of difference. The former, using the arithmetic mean throughout, obtains a value which is obviously too large. The latter uses the logarithmic mean for part of the temperature range and an approximate logarithmic mean for the remainder. The value obtained by the use of this method should very much more closely approximate the true mean.

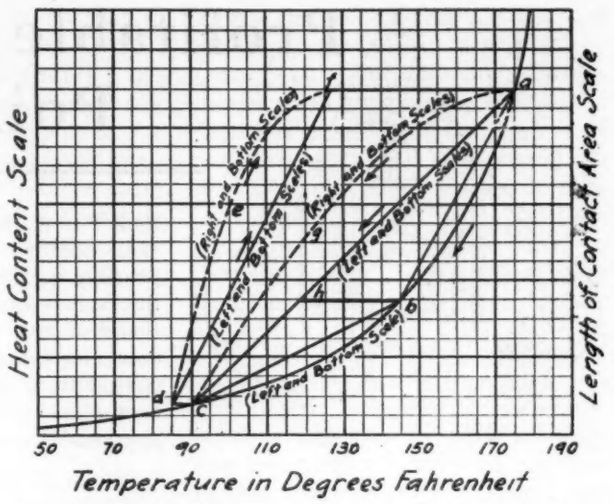


Fig. 5.—Relationship Curves Showing Temperature Difference for a Saturated Gas and a Cooling Liquid in Counter-Current Flow.

Which of the two methods is used would matter little if the ratio between them were a constant. This, however, is not the case, as will be shown. The expressions for the two methods may be stated as follows:

H. and M. method $\theta_m = \theta_A +$

New method $\theta_m = \theta_{log} + 0.5\theta_{ar}$

in which

θ_A = Arithmetic mean temperature difference between lines *ac* and *df*; the other symbols have the meanings already assigned.

If end-temperature differences are alike, then the logarithmic mean equals the arithmetic mean. In this special case the difference between the two methods is the least, the Haug and Mason method being the larger by one-half of θ_{ar}. When one end-temperature difference becomes smaller than the other, the error caused by using the arithmetic mean instead of the logarithmic mean increases rapidly. Such error amounts to 1, 5, 10, 25, 50, 100, and 200 per cent of the logarithmic mean when one end-temperature difference is 30, 55, 67.5, 83, 92, 98 and 99.75 per cent respectively smaller than the other. It can thus be seen that there is not even an approximate ratio between the two methods. Consequently the method which nearest approaches the true conditions must be used; otherwise a false value will be obtained for the heat transfer coefficient per unit contact area in unit time.

The mean temperature difference is affected by still another influence. The heat transfer coefficient of the hot moisture laden gas will approach that of steam, while this coefficient for the cooler gas will nearer resemble that of a dry gas. Consequently more heat will be transferred at the hot end of the condenser than at the cold end under identical conditions. This refinement has not been taken into consideration. The influence caused by this condition would change for every gas temperature and must thus be considered for each individual condenser calculation. Since this influence is intimately connected with the overall coefficient of heat transfer it is suggested, for lack of a better method, that it be considered a function of this coefficient.

Numerical Example for the Mean Temperature Difference

The specific example shown in Figure 5 can conveniently be used as a numerical comparison between the two methods. The calculations for the Haug and Mason method are

$$\theta_A = \frac{49+5}{2} = 27,$$

$\theta_{ar} = 20$ (by trapezoidal rule)

$\theta_m = \theta_A + \theta_{ar} = 27+20 = 47$

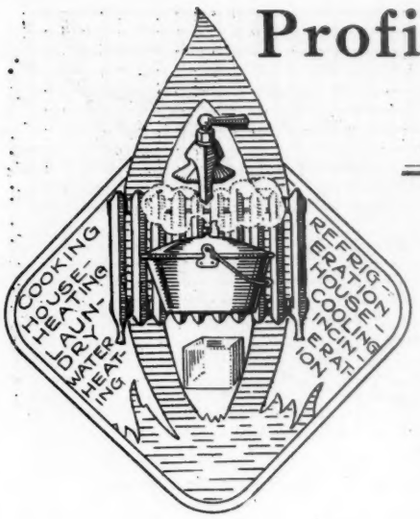
The calculations for the new method are

$$\theta_{log},\ \frac{\theta_s}{\theta_L} = \frac{5}{49} = 0.102,$$

$F = 0.395,$

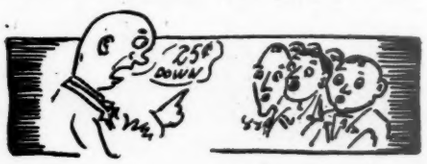
$\theta_{log} = (49)(0.395) = 19.4,$

$\theta_m = \theta_{log} + 0.5\ \theta_{ar} = 19.4+10 = 29.4$



Profitable Pointers

"WITH retail selling this year, we are going out to sell usage" said a salesmanager the other day; "in years past we went out and sold low down payment and long extended payments. This gave us records, but we have come to the conclusion that today with much of the old stuff that necessitated these drawn out payment plans out of the picture, we can go out and do a very creditable and lasting job selling value at a fair price plus the service our merchandise will give the consumer." To us that seems to be the reasonable attitude. Many gas men have a memory of high-pressure activities that sold hundreds of ranges, water heaters and other appliances on the "big-commission-low-payment" plan that bounced back. These sales, where "all you gotta do is sign here," were in the main poor business.



THAT we are on the right track in suggesting that gas men, to a man, get behind the movement to have a gas kitchen in the store of every gas company seems to be borne out as we thumb through advertising and editorial pages of the popular women's magazines. So we say give the customer what he wants, a modern GAS kitchen. As time goes on, and spring actually arrives, Mrs. Charlie Consumer is going a-shopping for modern kitchen equipment and it is up to us to see that it is a GAS kitchen—we have all she can possibly desire: speed, silence, cleanliness, low operating costs, low maintenance cost, color, shape, size, design, anything—but we also have competition unless we display and demonstrate our appliances in a suitable modern setting.

IT seems to us that the natural gas companies serving the greater Pittsburgh area have hit upon a happy idea in telling of the many uses for GAS service in the home. These advertisements approach the subject from an entirely new angle: "Pennies, Nickels . . . Dimes", is the caption that catches the eye of the present customer as well as the one-to-be . . . then the text gets right down to a clinching sales talk on the use of gas and gas appliances. Another thing that we like about this advertising is the fact that it says in bold face type that gas will do certain, definite tasks for a certain definite amount of money. Money talks today; it talked yesterday and it will talk tomorrow. Give 'em facts, gas men, tell 'em and you'll sell 'em.

THE February issue of "Magic Chef" has caught our eye and the streamer at the top of the page

PENNIES 1¢ 1¢ 1¢
Nickels...DIMES!
5¢ 10¢

See How Much Comfort, Convenience and Cleanliness They Buy When You Use Modern Gas Appliances

DID you ever stop to realize how much you get in return for the few dollars you spend each month for Natural Gas Service? If you haven't, note the average costs, shown below, for operating modern gas appliances—and you'll get a new appreciation of what Gas Service means, or can mean, to you in your home. And incidentally, as you look at these low costs, you might congratulate yourself on living in this Pittsburgh district where Natural Gas, rich in heat units, is available at rates that are only one-fourth to one-half what they are in many other large centers not so fortunately situated.

A MODERN GAS RANGE . . . . .
Smartly styled, with oven control, insulated oven and many other convenience features that make cooking and baking a real pleasure. Will cook and bake for a family of four at a cost of.....ONLY 1 CENT PER MEAL.

A MODERN WATER HEATER . . .
Will provide hot water—automatically and without waiting—for shaving, for bathing, for washing dishes, for washing clothes, and for all cleaning tasks about the home for an average cost of.....ONLY 5 CENTS PER DAY.

A MODERN RADIANT HEATER . .
For auxiliary heating, for heating individual rooms, and for taking the chill off the house in spring and fall without using the furnace. Gives quick, cheery, healthful warmth at a cost of.....ONLY 1 CENT PER HOUR.

A MODERN GAS REFRIGERATOR
Unquestionably the last word in automatic refrigeration. Absolutely silent because there is nothing in it that can possibly make noise—a tiny gas flame does all the work. No moving parts to wear out, vibrate or require servicing. Costs.....ONLY 2 CENTS A DAY TO OPERATE.

A MODERN GAS INCINERATOR
Provides quick, economical and sanitary disposal of all garbage, and eliminates once and for all the unsightly, objectionable garbage can with its constant menace to health—at a cost of.....LESS THAN 2 CENTS PER DAY.

A MODERN GAS LAUNDRY DRYER
The most sanitary method of drying clothes. Makes you entirely independent of the weather, and saves from two to four hours each wash day. Circulating warm air dries clothes quickly and keeps them fresh and white. Saves time, money, labor—and clothes. Average operating cost is.....ONLY ABOUT 30 CENTS PER WASHING.

MODERN GAS HEAT . . . . . .
Completely automatic, frees you forever from the drudgery of furnace-tending; provides a constant uniform temperature that safeguards health—and comfort, convenience and cleanliness you can get with no other fuel. Costs, with modern efficient equipment, on either purchase or rental plan, are surprisingly low—and accurate estimates, based on your own individual requirements, are offered free of charge by your Gas Company.

MODERNIZED ECONOMICAL GAS

DO YOU KNOW?
That Gas Rates in the Pittsburgh District, based on the number of BTU's or heat units, delivered per 1000 cubic feet, are only one-fourth to one-half the rates in many other large cities.

NATURAL GAS COMPANIES
Serving the Greater Pittsburgh Area

stands out in bold relief; the eye-opener is an article entitled "At Last —The Spotlight Turns to the Kitchen," and as it is written by none other authority than Dorothy E. Shank, we, without any more comment, commend its reading to you gas men who are All-GAS-Kitchen minded.

THE Laclede Gas Light Company, St. Louis, has put a new and, in our opinion, a profitable twist to the well-known "Old Range Contest." The contest is being conducted in connection with a series of cooking classes held in the company's auditorium in their main downtown store, and which is being broadcast daily at 11 a.m. over Radio Station KSD.

To give the 64 local dealers a tie-in, the gas company is running 3 column 16 inch advertisements in the St. Louis daily newspapers. All dealers are authorized to receive entry coupons. This in itself is a gesture in the right direction as these coupons will no doubt carry the names of many potential purchasers of new ranges, and the dealers who follow through will develop a profitable new range business. Judging the oldest stove will also be done by four dealers, while the award will be made by the Laclade Company. This, it seems, is an idea for gas men who wish to solidify dealer good-will and at the same time keep the gas cooking load by selling modern gas ranges.

In reproducing a specimen of the newspaper advertising herewith, the lower portion of the ad containing a listing of gas range dealers in St. Louis has been eliminated.

Win this range FREE

Winner of "Old Gas Range Contest" will receive FREE this 1934 model Quick Meal Magic Chef Gas Range

For more than half a century gas has been and continues to be the most popular cooking fuel because no other fuel can offer all the advantages of gas . . . speed, economy, convenience, flexible heat.

A lot of gas ranges have been in service in St. Louis for many years. We'd like to find out whose range has been in longest continuous use, and to the owner of that range we will present absolutely free a 1934 Quick Meal Magic Chef (price $138.50).

This contest is being conducted from the daily cooking classes held in the Laclede Auditorium and broadcast over radio station KSD at 11 o'clock each weekday morning. Tune in KSD and hear these interesting cooking classes, or when you're downtown stop in and watch the broadcast, there are plenty of comfortable seats in the Laclede Auditorium, 11th and Olive Streets.

How to Enter Your Gas Range in "OLD RANGE CONTEST"

Fill out the coupon below and give it to your dealer or mail it to radio station KSD. Contest closes at midnight February 6th and any entries postmarked later than that date will be disqualified. Prize range will be awarded at the KSD cooking school in the Laclede Auditorium as soon as the judges are able to determine the winner. The Laclede Company has nothing to do with the selection of the winner, that task is in the hands of the following judges: Bernard Gude, Joseph Manne, Alvin J. Kroemeke, Joseph J. Hellrung.

This coupon is for your convenience, but it is not necessary to use the coupon in order to enter the contest. Just give your dealer the information about your gas range.

ENTRY BLANK
"Old Range Contest"

Name.....

Address.....

Stove No..... *Serial No*.....

Year range was installed..... *Month*.....

NOW that the season is approaching when the housewife will again begin to think of food preservation, the gas man will do well to begin to store up ideas to promote the silent gas refrigerator. Here is a window display idea that comes from the West Texas Gas Co., Lubbock, Texas, that we suggest you clip and put into your window display file or scrap book. The cut-outs and side panels were supplied by the manufacturers at a small cost and it is just possible that they may have additional ones (these were made up a year or so ago). If not, a local artist can reproduce them for you. The point is that the "pennies" idea is an effective one.

IN normal times the replacement business was equivalent to ten per cent of the ranges in use, however, what do you suppose it is now? Very few gas companies sold ten per cent of their range users new ranges last year or even the two years before. Reasoning along this line it does look like 1934 will be a big gas range year. The thing we like about it is that all the old cut-price stuff will be taken out of selling gas ranges before the season gets into full swing. You know that will be helpful and that this end of the appliance business will show a profit that will encourage management to kick-in a bit more on the advertising budget.

HOME service departments are being revived by a great many gas companies, but their efforts will be along entirely new lines, so we understand. One instance of a "new deal" for the home service activity is the home service session or cooking school conducted by the Oklahoma Gas and Electric Company. This company conducts a special school for the home manager of tomorrow. These young ladies, ranging from eight to fourteen years of age, are given a series of lessons and upon completion are graduated, and the tie-in comes from the fact that papa and mamma are invited to the graduation exercises.

Technical Digest

GAS PURIFICATION

Gas is purified from hydrogen sulfide, hydrocyanic acid and other acidic impurities by treatment with an alkaline liquid containing a catalyst or a metal compound in solution or in suspension, for example a solution of a complex sodium thioarsenate. Prior to such treatment part of the gas is freed from ammonia and then is remixed with the remainder of the gas, the final ammonia content being thereby so adjusted as to maintain the best pH in the purifying solution.—British Patent No. 392,544, filed November 16, 1931.

COMBUSTIBLE COKE FROM GAS RETORTS

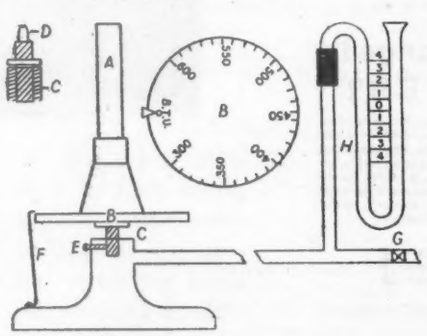
Coke made in horizontal and vertical retorts was tested in a domestic open grate, provided with grates of both the well and the barred type. Measurements were made of the heat required for the ignition of the coke, the time required for an intense fire to be obtained, the highest rate of radiation attained and the percentage of fuel consumed. Vertical retort coke was found to be superior to horizontal retort coke in burning qualities. In general, the milder the heat treatment to which the coal has been subjected during carbonization, the better its burning qualities. The coke should not be overheated in the retorts by decreasing the time of carbonization without increasing the temperature.— *J. G. King, Gas Engineer Volume 50, 1933, pages 59 to 62.*

REACTIVITY OF COKE

The reactivity of coke has been investigated at temperatures in excess of 1000 degrees C. The times which are required for the combustion in air of 0.6 gram of active carbon, lignite coke, electrode coke, metallurgical coke, and graphite (graded 0.5 to one millimeter) were observed, using initial temperatures varying from 700 to 1300 degrees C. Wide variations in the combustion times were observed with an initial temperature of 700 degrees C, but these differences almost disappared when 1200 degrees C was reached. The temperature rises 100 to 300 degrees C during combustion, due to the exothermic reaction. To avoid this, further tests were made, using instead of air a gas mixture containing 11.9 per cent of carbon dioxide, 9.5 per cent of oxygen and 78.6 per cent of nitrogen. With complete conversion into carbon monoxide, the net heat of reaction is nil, and the temperature during gasification was thus kept constant to 5 degrees C. In this series reactivities were expressed by Hausser's method. The conclusions reached agreed with those from earlier tests, that is, that differences in reactivity thus measured are small at 1500 degrees C. Since cokes showing wide differences in reactivity below 1000 degrees C behave practically the same at hearth temperature, an unreactive coke, giving a low "solution" loss, is required for blast furnace purposes. —*H. Broche and H. Nedelmann. Stahl und Eisen, 1933, volume 53, pages 144 to 147.*

CALORIMETER FOR SMALL PLANTS

This calorimeter, which is inexpensive, portable and reasonably accurate, is recommended for gas plants which can not afford expensive calorimeter equipment. It is stated that this type of calorimeter has been used to determine the B.t.u. value of various gases and gas mixtures and, when compared with a standard calorimeter, has not at any time varied more than 5 B.t.u.



The accompanying figure and explanation give an idea as to its construction and operation:

Bunsen burner A is fitted below the cone and barrel with a disc B which revolves on a micrometer screw thereby regulating the supply of air to the gas to be burned and thereby tested as to calorific value. Divisions on disc B are calibrated against actual calorific values, zero position being fixed by means of set screw E. The gas enters the burner proper through an adjustable standard orifice jet D. It is regulated by cock G to constant pressure as observed on gauge H.

The disc B is set to zero and the air is entirely shut off, this being accomplished by moving the adjustable jet up or down after releasing the set screw and re-tightening. Disc B is then gradually turned to the left, admitting air, until the gas begins to back-fire and continues to do so. Indicator F then points to the reading which shows the actual B.t.u. value of the gas.

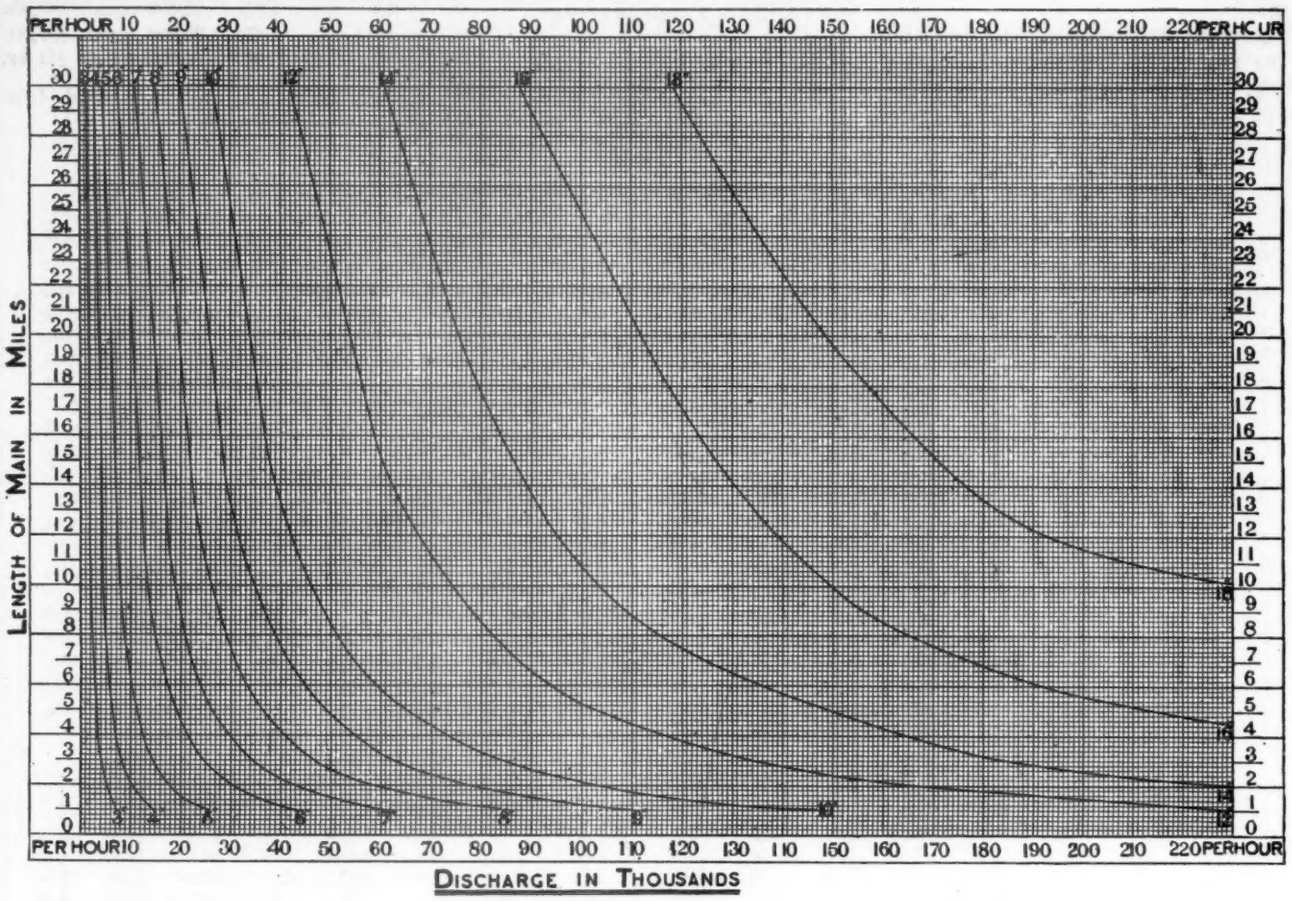
This C. G. Burna Calorimeter is being used in plants whose outputs vary from 5,000 M to 700,000 M per year.—*The Gas World, London, Nov. 25, 1933, page 536.*

PURIFYING GAS BY THIONATE SOLUTION

The literature on the removal of ammonia and sulfuretted hydrogen from gas by means of thionate solutions is reviewed and the various methods critically compared. Ammonia and sulfuretted hydrogen must be removed from the gas in the ratio of 2:1. Metallic thionate solutions and ammonium polythionate solutions are employed, while thiosulfate-sulfur dioxide solutions are used to remove sulfuretted hydrogen separately, or in the case of metallic thionate solutions, ammoniacal iron hydroxide suspensions are used to remove the hydrogen sulfide. The properties and the mechanism of the action of these solutions are explained. Means are also described for simultaneous removal of ammonia and sulfuretted hydrogen, ammonium polythionate solution and iron thionate solution being used. The technical development of the thionate process is also discussed.—*Dr. C. J. Hansen. Chemiker Zeitung, volume 57, 1933, pages 361 to 363 and 382 to 383.*

CALCULATING SIZES OF HIGH PRESSURE MAINS

After discussing the complexity of the flow of gas through high pressure mains, the author proceeds to the development of a table and curve whereby the diameter of a particular



Curve for Calculating Sizes of Mains

main can be quickly and easily calculated.

The curve is calculated on the basis of an initial pressure of 19.7 lb. absolute and a terminal pressure of 17 lb. absolute. Oliphant's formula is the basis for the calculations. (See page 17, January issue, *American Gas Journal*, for formula and constants.)

From the curve and table given herewith the author solves several problems, to wit:

A main 4 miles long is required to supply 100,000 cu. ft. of gas with an initial gauge or static pressure of 20 lb. and a terminal gauge pressure of 5 lb. From the table a factor of 2.87 for a range of 20 lb. to 5 lb. is found. Then, 100,000 divided by 2.87 equals approximately 35,000. From the curve the required size of main is found to be 8 inches.

Another problem is shown in Figure 1. A must supply 12,000 cu. ft. per hr.; B, 10,000; C, 6,000; D, 6,000; and E, 6,000. The size of the main can be reduced at X and Y.

Now, 40,000 cu. ft. flow from Town to X at an initial gauge pressure of 20 lbs. A pressure of 5 lbs. is needed at inlet of the village governors. Assume that up to X there is a pressure drop of 5 lbs., and, from X to Y a drop of 5 lbs.

The drop from Town to X is 5 lbs.; hence, the pressure at X is 20 minus 5, or 15. From the table a factor of 1.8 is found (range of 20 to 15 lbs.). Then, 40,000 divided by 1.8 gives approximately 22,000. This quantity of gas for a two-mile run needs a 6-inch main, as gotten from the curve.

From X the main supplies B, C and D with 22,000 cu. ft. Pressure drop from X to Y is 5 lbs.; hence, pressure at Y is 15 minus 5, or 10 lbs. Factor from the table for a range of 15 to 10 lbs. is 1.65; 22,000 divided by 1.65 is approximately 13,500; from the curve 13,500 for 2 miles requires a 5-inch main.

From Y 6,000 cu. ft. per hr. flow to the village. Pressure at Y is 10 lbs. and terminal pressure at governor inlet is 5 lbs. From table, for a range of 10 to 5 lbs., the factor 1.50 is obtained; 6,000 divided by 1.50 gives 4,000; from the curve 4,000 for 2 miles indicates a 3-inch main. However, it would be advisable to run a 4-inch main from Y to the village, because from the curve the position shows that a 3-inch size shows too little marginal difference.

Branch line E has an initial pressure of 15 lb. and an inlet governor pressure of 5 lbs.—a loss of ten pounds. Factor from table (15 to 5) is 2.23; 6,000 divided by 2.23 gives approximately 2,700; 2,700 for 1 mile from the curve shows a 3-inch main.

Branch D has an initial pressure of 10 lbs. and a final pressure of 5 lbs. at the governors. Factors from table (10 to 5) is 1.50; 6,000 divided by 1.50 gives 4,000; 4,000 for 1 mile from the curve shows a 3-inch, which for the same reason as in section C, should be increased to 4 inches.

If the pressure is increased the flow can easily be ascertained by multiplying the factors in the table,

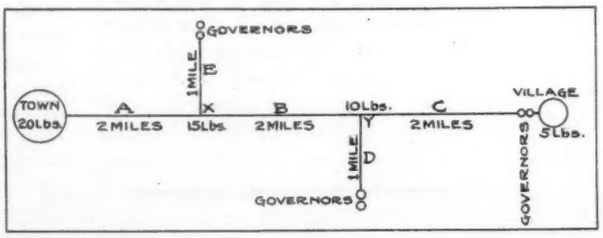


Figure 1

thus:

Assume it is required to find the flow from a 10-inch main, 3¼ miles long, by increasing the initial pressure and keeping the terminal pressure at 2 lb. (high pressure).

Initial pressure	Factor	Flow
8	1.54	80,000 equals 123,000
9	1.69	80,000 equals 135,000
10	1.83	80,000 equals 146,000
15	2.47	80,000 equals 197,600
20	3.05	80,000 equals 244,000

—Geo. H. Elliott, The Gas World, London, Jan. 13, 1934, pp. 31-33.

Table

1-tenth of an inch water column = 0·0036 lb. per sq. in.
12 in. water column = 0·433 lb. per sq. in.
Mercury column can be taken at 2 in. = 1 lb. per sq. in.
1 in. = 25·4 millimetres. 1 in. water = 0·073 in. or 1·9 mm. mercury.

Initial Pressure in Pounds per Square Inch (Static).	Terminal Pressure in Pounds per Square Inch (Static).													
	0·5	1·0	1·5	2·0	2·5	3·0	3·5	4·0	4·5	5·0	5·5	6·0	10	15
1·0	0·40	—	—	—	—	—	—	—	—	—	—	—	—	—
1·5	0·56	0·40	—	—	—	—	—	—	—	—	—	—	—	—
2·0	0·70	0·57	0·41	—	—	—	—	—	—	—	—	—	—	—
2·5	0·81	0·70	0·58	0·41	—	—	—	—	—	—	—	—	—	—
3·0	0·91	0·81	0·72	0·59	0·42	—	—	—	—	—	—	—	—	—
3·5	1·00	0·92	0·83	0·72	0·60	0·42	—	—	—	—	—	—	—	—
4·0	1·10	1·04	0·94	0·84	0·74	0·61	0·43	—	—	—	—	—	—	—
4·5	1·18	1·11	1·04	0·95	0·87	0·74	0·61	0·43	—	—	—	—	—	—
5·0	1·26	1·20	1·13	1·05	0·96	0·87	0·76	0·62	0·44	—	—	—	—	—
5·5	1·34	1·28	1·21	1·14	1·06	0·98	0·88	0·76	0·63	0·44	—	—	—	—
6·0	1·41	1·36	1·30	1·23	1·16	1·08	0·99	0·89	0·78	0·64	0·45	—	—	—
6·5	1·48	1·43	1·38	1·31	1·24	1·17	1·09	1·00	0·90	0·80	0·65	0·45	—	—
7·0	1·56	1·51	1·45	1·39	1·33	1·26	1·19	1·10	1·01	0·92	0·80	0·65	—	—
7·5	1·62	1·58	1·53	1·47	1·41	1·35	1·27	1·20	1·12	1·04	0·92	0·80	—	—
8·0	1·70	1·65	1·60	1·54	1·49	1·43	1·36	1·29	1·22	1·15	1·04	0·93	—	—
8·5	1·76	1·72	1·67	1·62	1·56	1·51	1·45	1·38	1·31	1·25	1·14	1·05	—	—
9·0	1·83	1·78	1·74	1·69	1·64	1·58	1·53	1·47	1·40	1·34	1·24	1·16	—	—
9·5	1·90	1·84	1·80	1·76	1·71	1·66	1·60	1·54	1·48	1·43	1·34	1·25	—	—
10·0	1·96	1·92	1·87	1·83	1·78	1·73	1·68	1·62	1·56	1·50	1·43	1·35	—	—
11·0	2·08	2·04	2·00	1·96	1·92	1·87	1·82	1·77	1·72	1·66	1·60	1·53	0·71	—
12·0	2·21	2·17	2·13	2·09	2·05	2·00	1·96	1·91	1·86	1·81	1·75	1·69	1·02	—
13·0	2·33	2·30	2·26	2·22	2·18	2·14	2·10	2·05	2·01	1·96	1·90	1·85	1·28	—
14·0	2·45	2·41	2·38	2·34	2·31	2·27	2·23	2·19	2·14	2·10	2·05	2·00	1·47	—
15·0	2·57	2·53	2·50	2·47	2·43	2·40	2·36	2·32	2·28	2·23	2·19	2·14	1·65	—
16·0	2·68	2·65	2·62	2·59	2·56	2·52	2·48	2·45	2·41	2·36	2·32	2·28	1·83	0·78
17·0	2·80	2·76	2·74	2·71	2·68	2·64	2·60	2·57	2·53	2·49	2·45	2·41	1·99	1·11
18·0	2·91	2·88	2·86	2·82	2·79	2·76	2·73	2·70	2·66	2·62	2·58	2·54	2·15	1·37
19·0	3·02	3·00	2·97	2·95	2·91	2·88	2·85	2·82	2·78	2·74	2·71	2·67	2·30	1·60
20·0	3·14	3·11	3·08	3·05	3·02	3·00	2·97	2·94	2·90	2·87	2·83	2·80	2·45	1·80
30·0	4·22	4·20	4·18	4·16	4·14	4·12	4·10	4·07	4·05	4·03	4·00	3·98	3·74	3·35
40·0	5·27	5·26	5·25	5·23	5·21	5·19	5·18	5·16	5·14	5·12	5·10	5·08	4·90	4·61
50·0	6·31	6·30	6·29	6·27	6·26	6·24	6·23	6·21	6·20	6·18	6·16	6·15	6·00	5·76
60·0	7·33	7·32	7·31	7·30	7·28	7·27	7·26	7·25	7·24	7·23	7·22	7·20	7·07	6·87
70·0	8·36	8·35	8·33	8·32	8·31	8·30	8·29	8·28	8·27	8·26	8·24	8·22	8·12	7·95
80·0	9·37	9·36	9·35	9·34	9·33	9·32	9·31	9·30	9·29	9·28	9·27	9·26	9·16	9·01
90·0	10·38	10·37	10·36	10·36	10·35	10·34	10·33	10·32	10·31	10·30	10·29	10·28	10·20	10·07
100·0	11·39	11·38	11·37	11·37	11·36	11·36	11·35	11·34	11·33	11·32	11·31	11·30	11·24	11·10

DISTILLATION OF COAL AT LOW TEMPERATURE

The coal is compressed into a series of small compartments, about 250 cubic centimeters capacity, arranged side by side to form a pocketed plate. A number of such plates are superimposed so that each compartment is closed, though not in gastight manner, by the bottom of the corresponding compartment in the superimposed plate, the compartments of the top plate being provided with special closing elements. The whole is then heated to a temperature of 550 to 850 degrees C. The compartments are so shaped that passages are formed between them to allow access of heat and free liberation of the products of the distillation. According to the second patent, carbonization is effected by passing the pile of charged plates through an externally-heated tunnel or muffle oven, suitable forms of which are described.—*C. Francois. British Patents Nos. 384,171 and 384,172.*

COKING BITUMINOUS COAL

New views on the coking process of bituminous coal are given. Slight oxidation of a bituminous coal reduces its expansive pressure to zero without appreciably affecting the swelling or caking powers. The latter properties are lost in succession on further oxidation. Similar effects are produced by heating the coal with sulphur or metallic oxides or sulphides. Loss of expansion pressure is also brought about by heating the coal with caustic alkalies or boric acid. The addition of half a per cent of boric acid reduced the expansive pressure of a "fat coal" to zero. The addition of not less than two per cent also reduced the yield of low temperature tar from the coal from five per cent of a brownish-black viscous tar to 3.25 per cent of a yellowish-brown, mobile tar, lower in phenols and benzine in soluble constituents. The addition of boric acid had no effect on the softening point, but diminished the plasticity of the coal. It is concluded that boric acid forms a complex with some of the coal constituents, probably by attachment to the hydroxyl groups. Boric acid had no effect on the yield of tar from a dull, coal.—*G. Lambris. Das Gas und Wasserfach, 1933, volume 76, 1-3.*

ELEMENTS OF GAS TECHNOLOGY

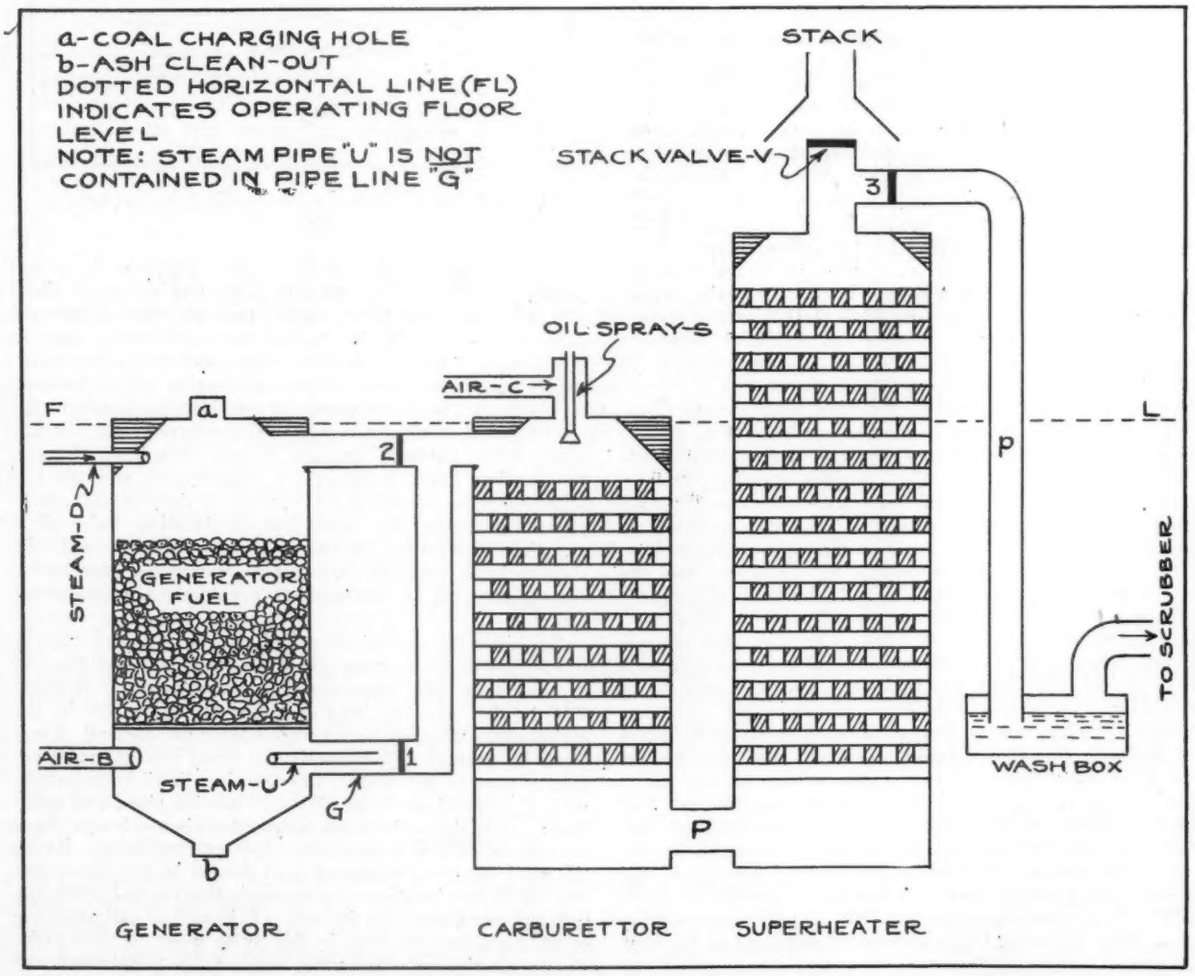
Carburetted Water Gas

CARBURETTED water gas, which is water gas that has been enriched or has had its thermal value increased by the addition of oil in a gasified form, was perfected about sixty years ago by Professor T. S. C. Lowe at Norristown, Pa. It is of interest to know that carburetted water gas now constitutes upwards of sixty per cent of the total gas made in this country for distribution in city gas mains.

As is well known, the first gas developed in this country was coal gas, and for many years gas service standards were based on candle power. Hence, Professor Lowe developed carburetted water gas mainly in order to readily produce a satisfactory gas that would meet the candle power requirements—the addition of oil in a gasified form to straight water gas raised the candle power of the water gas or rather, produced a resultant gas of the requisite illuminating power; obviously, the oil furnished the illuminating feature. Incidentally, but of no small moment, the addition of oil to the water gas produced a resultant gas that not only ran relatively high in candle power but also one that was considerably higher in thermal (B.t.u.) value.

One of the prime motives for the development of carburetted water gas was the fact that the materials for raising the candle power of coal gas to the required standard were becoming relatively scarce or higher in price.

Up to about twenty years ago, many communities in this country stipulated a gas with a candle power of twenty candles; from a thermal standpoint, this meant a gas of upwards of 650 B.t.u. per cubic foot. Since the abolishment of the candle power standard as legal requirement in favor of a thermal (B.t.u.) standard, it has been found that such a high B.t.u. value as 650 is not economical for either the gas company or the consumer. Hence the amount of oil added to the water gas per thousand of carburetted water gas produced has been decreased, so that a gas of approximately 530 B.t.u. per cubic foot is about the standard accepted for manufactured gas throughout the country. It is of interest to note that the introduction of the Welsbach mantle and its subsequent rapid acceptance spelled the doom of the flat flame for illumination and in turn the need for a gas of high intrinsic illuminating value. As is well known, the Welsbach mantle depended exclusively on the B.t.u. in the gas to bring it to incandescence and thereby furnish illumination. As



Graphic Sketch of Carburetted Water Gas Plant

gas lighting began to yield the lighting field to electricity gas companies began to seek other fields for gas utilization. All of these fields were interested solely in the heating value of the gas to carry on their heating processes, and not illuminating qualities. In short then, state regulatory commissions saw the wisdom of permitting gas companies to lower the B.t.u. standards to about 530 B.t.u. per cubic foot, instead of adhering to a higher figure which required more oil for carburetting and was uneconomical.

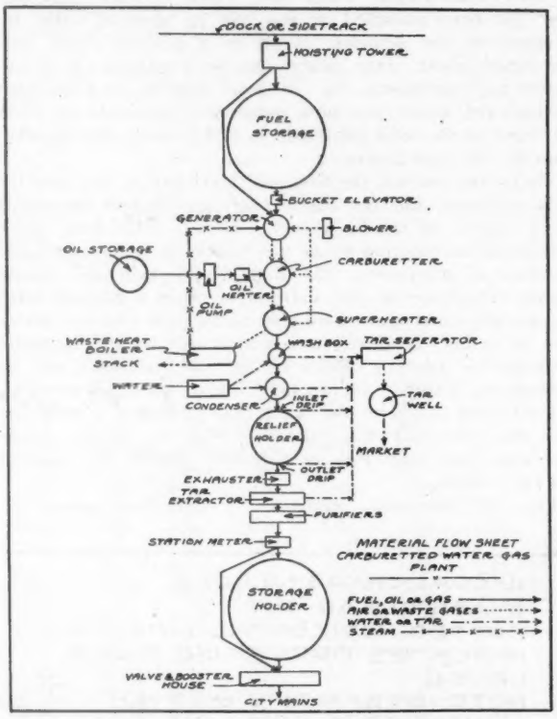
Simply stated, a carburetted water gas set consists of a water gas apparatus to which has been attached in series two other pieces of apparatus—a carburettor and a superheater—which perform the function of providing means or equipment for introducing and fixing the oil used for carburetting. Like the water gas process, the carburetted water gas process uses solid fuel to produce the blue or water gas, which has a B.t.u. value of about 300 and which depends upon the addition of oil in a vapor form to increase its heating value to 530 or whatever point is required (carburetted water gas as high in heating value as 1000 B.t.u. per cubic foot has been commercially made by using very large quantities of oil for enrichment). The solid fuels principally used are hard coal and coke. About eight years ago a method was perfected for successfully and commercially using soft coal for producing the base gas—water gas. This, the Pier Process, will be described in a subsequent chapter. It should be stated at this point that originally a high grade of oil was required for carburetting the blue or water gas; lately, methods have been perfected whereby heavier and less expensive oils can be used.

While it is planned to describe in subsequent chapters the refinements that have been added to Lowe's original apparatus, such as the Back Run, Waste Heat Boilers, Ignition Arch, Grid Screen, the Reforming of Natural Gas, etc., it would be well to describe the apparatus and process on the basis of its accepted form as of about twenty years ago. Also, a simple graphic sketch, see Figure 8, will be used in the description of the same.

The apparatus consists essentially of three cylindrical chambers—Generator, Carburetter and Superheater. The outer walls of these three component parts are made of steel plate and are lined with fire brick. There is a space between the fire brick and the steel shell which is packed with insulating material in order to minimize heat lost due to radiation. The Carburetter and Superheater are almost completely filled with brick, called "checker brick", which are stacked or laid with ample voids or interstices to both permit the relatively easy flow of the gases through them and to provide a large surface area. It goes without saying that various gauges, thermocouples and other registering devices are placed at strategic points on the apparatus so as to give the operator an indication as to how the gas making cycle is proceeding.

After a fire has been started in the Generator and the entire set of apparatus has been brought to the proper status as regards heat, fuel is charged into the Generator. This is either hard coal or coke. (In some gas making plants two processes are employed, coal or coke oven and carburetted water gas set—in such a situation coke from the former apparatus constitutes the fuel for the Generator). A blast of air at a pressure of about 20-40 inches of water is then blown through the fuel bed. As brought out in previous chapters, the oxygen in the air first burns the carbon in the fuel bed to carbon dioxide; as this carbon dioxide passes up through the balance of the fuel bed it is converted or reduced to carbon monoxide by the action of carbon. We then have leaving the top of the bed of fuel in the Generator a hot gas—temperature about 1900° F.—consisting essentially of nitrogen, and carbon monoxide, the latter being at least 30 per cent of the total volume.

At this stage we have a condition where the action of the blast of air in passing through the generator fuel bed has rendered the selfsame fuel bed sufficiently hot to give rise to the requisite water gas reaction when steam is later passed through the fuel bed, and has also produced a combustible gas which is necessary for heating up the checker brick work in the Carburetter and Superheater to the end that the process of carburettion will properly obtain when oil is later added to the water gas.



Adapted from "Manufactured Gas," by Jerome J. Morgan

This combustible gas, which is at a temperature of upwards of 1900° and which has a thermal value of about 300 B.t.u. per cubic foot, passes through valve 2, valve 1 being closed and, at the top of the Carburettor meets a blast of air (Air C) where it ignites and the carbon monoxide constituent burns to carbon dioxide. This burning gives rise to the development of considerable heat and the hot products of combustion pass down through the checker brick work, through passage P and thence up through the checker brick work in the Superheater and out the stack valve to the stack for venting to the outside atmosphere. (During this operation of blowing valve 3 is closed.) Obviously, as the hot gases pass through the checker brick work in the carburettor and the superheater this brick work is constrained to store up considerable heat.

This blowing period is called the "blow" and usually is conducted for a space of 3 to 4 minutes. At the end of the "blow" the temperature in the carburettor is about 1400° Fahr. If too high a temperature obtains in the carburettor, lamp black and naphthalene are formed. Lamp black is "messy" and expensive to clean out and naphthalene is sure to be carried into the city distribution system with the attendant clogging up of service pipes and other damage. If the carburettor temperature is too low we have incomplete breaking up of the oil for carburettion. Hence the need for careful operation of the set by the gas maker and the proper location of accurate indicating and recording temperature gauges on the set. (It is well to call attention to the fact that the heat in the waste gases as they make their exit through the stack valve at a temperature of about 1300° Fahr. often finds utilization in producing steam through the medium of a waste heat boiler).

Improving Customer Relations

A Study of the Outstanding Causes for Bill Complaints and Suggestions for Satisfactorily Handling the Same and Thereby Building Friendly Relations

By FRANK L. HALLOCK

Chairman, Subcommittee on Improving Customer Relations Through Bill Investigations, American Gas Association

THE bill investigation prompted by the request of a customer for an explanation of charges for gas consumed, is an opportunity for the company to establish friendly relations with this customer. While it is the prevailing opinion that most such requests, of their own nature, cannot be good contacts, a study of the results of a number of investigations into customers' charges has revealed that it is possible to convince 84% of a group of customers of the fairness of the bill rendered. While no doubt a number of these customers cannot truly be said to be completely satisfied by the explanation given to them, the manner in which their complaint is handled, in the office or in their homes by the district investigator, has a great effect on the opinion which they will form concerning the company that serves them.

In this paper will be discussed the results of a question study in a number of companies serving widely scattered sections of the United States. This study has been made for the purpose of determining what complaints or causes for bill queries may be universal, and to determine further what may be the most satisfactory manner of handling the investigation in the office and on the district, so that these potential poor contacts may become the basis for friendly relations with the companies' customers.

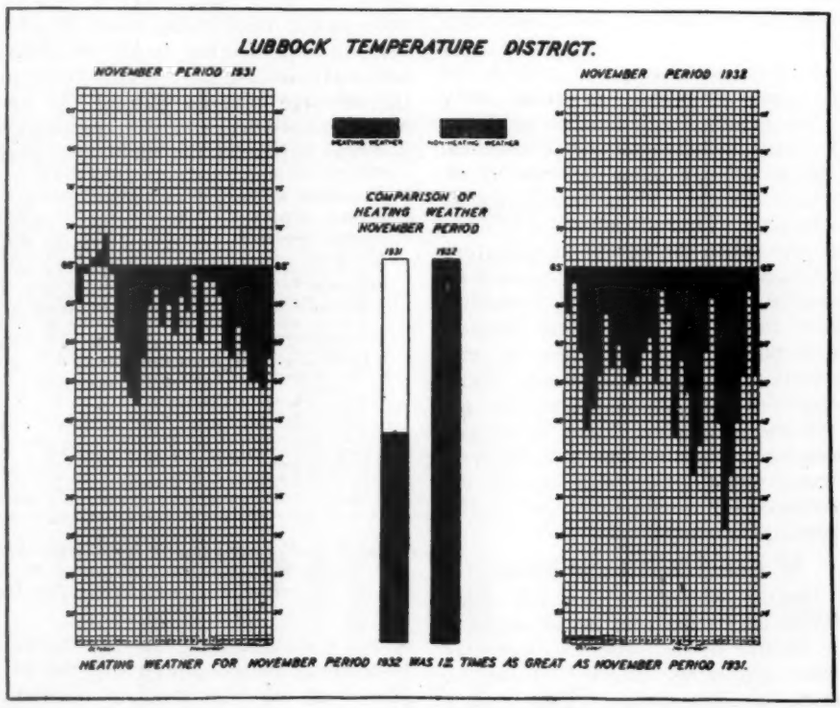

LUBBOCK TEMPERATURE DISTRICT.
NOVEMBER PERIOD 1931
NOVEMBER PERIOD 1932
COMPARISON OF HEATING WEATHER NOVEMBER PERIOD
1931
1932
HEATING WEATHER FOR NOVEMBER PERIOD 1932 WAS 12 TIMES AS GREAT AS NOVEMBER PERIOD 1931.

Chart 1—Answering the High Bill Complaint with a Picture

Causes of Bill Complaints

It is hardly necessary to state that in all of the territories reporting in the question study the general economic condition of the country was mentioned as being one of the chief contributing factors in bill complaints. This condition was expressed in many different ways, but outstanding is the fact that families have been combining, new mouths have appeared at family tables and as a result the gas bill has increased while the housewife has been making every effort to reduce the family budget.

Second only to economic condi-

Presented before 1933 Convention, American Gas Assn., Chicago, Ill.

tions is the result of seasonal temperature variations. It appears that in all parts of the country, but particularly in New England and in the Southwest, violent seasonal variations are such that customers forget in a warm period how much heat may have been needed the week before. In Chart No. 1 appears a novel solution of the problem employed by a company in Texas, in which a graph of the weather is set up so as to show vividly the weather and temperature variations. On this chart the present season is compared with the one a year ago. Such a chart might be useful as an insert with bills sent to house heating customers.

The third important factor in the survey as a cause for bill complaints was the use of the gas range as a space heater. While it is easy to convince a customer that using the range for a period of time will increase the gas bill, it is not always easy to detect from the customer's statement that this is what has occurred. In handling cases of this kind the employee must be a student of human nature as well as being thoroughly familiar with the appliances which are in the customer's home.

Prominent among the causes for bill complaints in the question study is the general unfavorable publicity at present bearing on public utilities. The most prevalent attacks come from the Middle West in and around Chicago. There conditions have progressed to the extent of reporters questioning customers in search of possible grievances. In handling these cases the companies affected have taken steps to make an extremely accurate check on every complaint that has received this unwelcome publicity. These investigations have revealed the unfairness of these complaints as well as the unscrupulous methods employed by the press in securing them.

Sectional Bill Complaints

Among the causes for bill complaints that appear to be sectional is the failure of customers to lock gas cocks supplying laundry stoves in apartment basements. This condition occurs only in the Central States, as the practice in the East is to supply the laundry stoves for most apartment houses through the landlord's meter, or as is the case in some large apartments, of setting an additional laundry meter for each customer. In the Southern sections reporting to the question study it appears that house construction, influenced by the general warm weather, is such as to make difficult the problem of house heating during cold spells. Houses are flimsily constructed, without weatherproofing in many instances, and wasteful heating losses result. In communities served by natural gas the question of undetected leaks and resulting losses is prominent, while in one metropolitan area two companies report the wastage of gas by disinterested parties such as servants in the home or chefs in hotels as a cause of bill complaints. In reviewing the causes for bill complaints it would appear that the problem resolves itself definitely into the necessity of training the company employee into the difficult task of becoming a diplomat and an expert on gas appliances used. If he is successful he will be able, in the most trying cases, to present the distasteful truth as pleasantly as possible to the customer, in the average case explaining the use of the appliance and the company's position fairly to the customer, and in a few instances actually to become a salesman in recommending the replacement of wasteful or obsolete equipment.

Classification Customer Claims	NEW ENGLAND STATES	MID. ATLANTIC STATES	CENT. WESTERN STATES	SOUTHERN STATES	WESTERN STATES	AVERAGE PERCENT
Usage less - Bill same	30.5	15.2	20.6	16.2	19.8	20.5
Normal usage - Bill increased	50.5	36.5	32.4	32.3	19.9	34.5
Bills differ from Neighbor	1.0	6.8	7.6	7.9	19.9	8.6
Did not realize period of Bill	2.2	5.2	3.4	12.8	4.9	5.7
Method - Cyclic or Continuous	Cycl.	Cycl.	Cycl.	Cont.	Cont.	
Bill never varies	1.0	4.0	3.6	1.6	3.5	2.7
Cust. delaying Credit Account	2.2	8.4	3.9		6.0	4.1
Inaccurate Index	1.0	7.5	7.4	1.6	12.0	5.9
Domestic Appl. Poorly Adjusted	1.0	2.7	5.7	10.5	3.0	4.6
Commercial Appl. Poorly Adjusted	1.0	1.5	1.1		.5	.8
Hotel & Rest.Appl. Poorly Adjusted	1.0	1.2	2.1		.5	1.0
House Heat. Appl. Poorly Adjusted	1.0	.7	2.3	.5	1.5	1.2
Misled as to Consumption-Sales Force	1.0	1.9	1.5	5.0	.5	2.0
Misled as to Consumption - Service Force		.5	.7			.2
Misled as to Consumption - Advertising		1.0	1.1		.5	.5
Caused by Leak-Company Negligence	2.5	.9	1.8	2.5	3.0	2.1
Caused by Leak-Others negligence		1.3	1.7	3.6	3.0	1.9
Billed in Improper Rate Schedule	2.5	2.5	1.9	5.5		2.4
Caused by Crossed Meters	1.0	1.2	.2		1.0	.7
Caused by Estimated Bill	1.0	1.2	1.0		.5	.8

Table 1—Summary of Customers' Stated Causes When Making Request for Bill Investigation

Customer's Stated Reason for High Bill	Compl. in Office	%	Referred to Dist. Invest.	%	Number For Test	%	Totals
1. Usage less—bill same	398	39.5	455	45 0	157	15.5	1,010
2. Normal usage—bill increased	2,420	22.6	8,012	75.5	178	1 7	10,610
3. Bills differ from neighbor	477	64 1	268	35 8	4	1	749
4. Did not realize period of bill	629	94.6	35	5.4	—	—	664
5. Bill never varies	379	65.1	197	34.0	6	.9	582
6. Customer delaying credit action	125	83.0	25	16.9	1	1	151
7. Claims inaccurate index	382	34.6	721	65.4	—	—	1,103
8. Domestic appliance poorly adjusted	60	35 3	108	63 5	2	1 2	170
9. Commercial appliance poorly adjusted	—	—	7	—	—	—	7
10. Hotel & restaurant appliance poorly adjusted	—	—	1	—	—	—	1
11. House heating appliance poorly adjusted	—	—	1	—	—	—	1
12. Misled by sales force	—	—	4	—	—	—	4
13. Misled by service force	—	—	1	—	—	—	1
14. Misled by advertising	—	—	—	—	—	—	—
15. Leak due to company negligence	4	11 7	29	85 3	1	2 9	34
16. Others negligence	8	53 4	7	46.6	—	—	15
17. Billed on improper rate schedule	—	—	—	—	—	—	—
Totals	4,882	32%	9,871	65%.	349	3%	15.102

Table 2—Percentages of High Bills Satisfied on First Contact with the Customer; Referred to District Investigator; and Referred Direct for Meter Test

Results of Studies to Determine Actual Causes and Final Disposition of Bill Complaints

In a preliminary study of bill complaints it was found that what the customer thought was the cause of an unusual billing could be classified roughly in 18 different statements. While these remarks on the part of the customer do not necessarily indicate the truth, it was felt that a study of these statements would be of interest in determining what training should be given to the employee interviewing this customer. Table No. 1 indicates the percentages of customers' statements falling in each of the different classifications. The first four classifications include by far the majority of all bill complaints; 65% of all cases being in this group. In one company an additional study was made of the disposition of such complaints and it was found that on the average 55% were completed by the office employee without a district investigation; 4% were satisfied with a meter test conducted by the company; leaving 41% for investigation in the customer's home, these investigations in turn were able to explain conditions satisfactorily to 71% of the customers visited, so that in summation an average of 12% of the original number of customers were left unsatisfied. A detail of the results of the general survey and of the figures obtained in one company appear in Tables 2, 3, and 5, and in Chart No. 2. From these broad figures the most obvious conclusion is naturally that most complaints of this nature are not justified. This being the case, the importance of proper training methods for company employees is even more evident. No one enjoys being told that they are wrong, hence the job of telling

	Usage Less Bill Same		Normal Usage Bill Increased		Bills Differ from Neighbor		Did Not Realize Period of Bill		Bill Never Varies		Customer Delaying Credit Account		Claims Inaccurate Index		Claims Domestic Appliances Poorly Adjusted		Claims Commercial Appliances Poorly Adjusted		Claim Hotel and Restaurant Appliances Poorly Adj.		Claims House Heating Appliances Poorly Adj.		Claims Marked as Unsatisfactory by Sales Force		Claims Marked as Unsatisfactory by Service Force		Claims Marked as Unsatisfactory by Advertising		Claims Caused by Lack of Co. Employees		Claims Caused by Lack of Co. Others		Claims Billed on Improper Rate Schedule		Totals	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Gas Consumed as Charged No Reason for Complaint	332	73.9	5465	68.4	214	78.5	28	80.4	161	82.7	19	79.2	542	78.0	70	65.5	6	85.7	1	100.0			3	75.0					24	68.9	5	71.5			6890	69.7
Increase due to Jewish Holiday	10	2.2	205	2.5	12	4.4			1	.5			5	.7	1	.9													1	2.8					233	2.4
Fluctuating Cons due to Heating with Appliance	32	7.2	353	4.4	12	4.4	1	2.8	4	2.0			10	1.4															1	2.8					413	4.2
Previous Month Under-read	3	.7	78	.9	2	.8	1	2.8					3	.4	1	.9																			88	.9
Bill incorrectly Dated			14	.2	2	.8	2	5.6																					1	2.8					19	.2
Error in Index	7	1.5	117	1.4	10	3.8	1	2.8			1	4.2	40	5.6	2	1.9																			178	1.8
Family Increased	3	.7	37	.4	1	.4							1	.1	1	.9	1	14.3																	46	.4
Additional Appliance Installed			18	.2			1	2.8	1	.5			2	.3	2	1.9													1	2.8					25	.3
Leak in House Pipe or Appliance	3	.7	115	1.4							1	4.2	3	.4															4	11.4	2	28.5			128	1.3
Refrigerator Installed			6	.1									1	.1																					7	.1
Seasonal Increase	12	2.7	180	2.2	7	2.8			1	.5	2	8.3	13	1.8	1	.9													1	2.8					217	2.2
Appliance not Adjusted Properly	46	10.0	1392	17.5	9	3.3	1	2.8	27	13.8	1	4.2	78	10.9	25	23.4					1	100.0	1	25.0			1	100.0	2	5.7					1584	16.1
Indexes Crossed and Crossed Meters			4	.1									1	.1	4	3.7																			9	.1
Shorter Daylight Period	2	.4	19	.2	2	.8							1	.1																					24	.2
Previous Meter Registering Slow			10	.1									1	.1																					11	.1
Totals.	450	100.0	8011	100.0	271	100.0	35	100.0	195	100.0	24	100.0	721	100.0	107	100.0	7	100.0	1	100.0	1	100.0	4	100.0	-	-	1	100.0	35	100.0	7	100.0	-	-	9870	100.0

Table 3—Summary of Causes for Complaint Classified by Customer's Statement

these facts to the customers becomes more difficult. In conducting the study of bill investigations in the company referred to the actual findings of the district investigator were tabulated and appear expressed graphically in Chart No. 3, supported by Table No. 5. It is evident that again a great percentage of bill investigations reveal that no inaccuracy in indexing or billing has occurred. In the final disposition of these complaints 70% fell under the classification of "Gas consumed as charged, no reason for complaint"; next in significance is the item of "Appliances not properly adjusted" which shows 16%; and third in importance is "Heating rooms with range," totaling a little over 4%. It is interesting to note that while 7.3% of all complaints resulted from the customer thinking an error had occurred in indexing; only 1.8% were actually caused by wrong indexes.

The manner in which a customer makes a request for a bill investigation controls the procedure involved. From the studies made by the committee it appears that a great proportion of the customers present their complaint in person at an office of the company. In one study of 9,003 such complaints, 55.1% called personally; 21.7% telephoned and 20.3% wrote letters, while 2.9% made a statement to a company employee who was visiting the customer's premises for some other purpose than that of conducting a bill investigation.

Due to such a great proportion of contacts being made in the company office the manner in which this customer is handled deserves study. The returns to the committee's questions indicate that 77% of the companies felt that the individual desk was preferable to the counter, the comfort and privacy afforded by the desk more than offsetting the loss of space involved. At a counter a conversation may easily become public, while an interested audience may increase the vehemence of what might otherwise have been a quiet explanation. When the contact employee is seated at an individual desk his personal dignity is enhanced, data on consumption of appliances may be maintained in an orderly manner, and the difficult task of pleasing this group of customers will be facilitated by the fact that they are resting in a chair. While some of the companies reporting to our question study stated a preference for women in this class of work, the preponderance of opinion was in favor of men, 77% of the companies for men and 23% of the companies for women. The reasons given are first, that a man gives the customer more of the impression that their case is being presented to someone in authority; second, that a man, if properly instructed, will be presumed to have a greater acquaintance with the mechanical and engineering angles of the case under consideration, than will a woman under similar circumstances.

The general disapproval of the telephone for use in discussing bill complaints would indicate that in the event of such a call coming in over the telephone, it

(Continued on page 34)

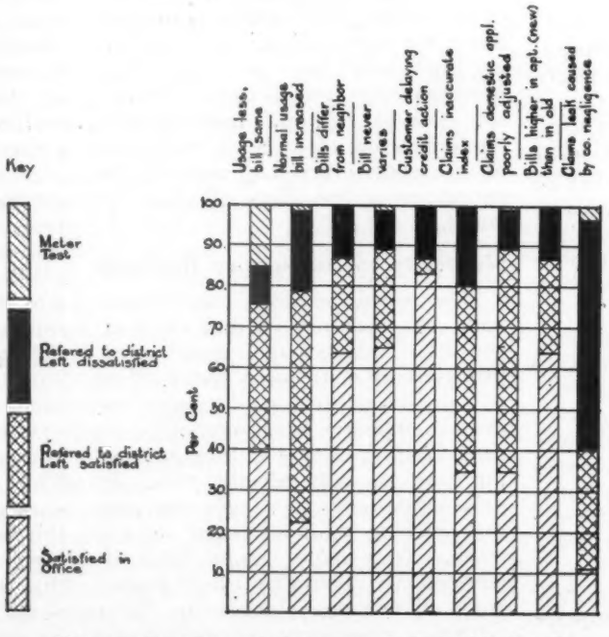


Chart 2—Per Cent of Customers Left Satisfied and Dissatisfied

What Newspapermen Want To Know About The Natural Gas Industry

Rates, Vested or Exclusive Rights, Advertising and Retail Merchandising, and Taxes and Excessive Profits Are Subjects Which Are Amply Clarified

By J. FRENCH ROBINSON
Vice-President, Peoples Natural Gas Company, Pittsburgh

IN TELLING you some of the things you want to know about the natural gas industry, it is not my purpose to discuss all utilities, but merely to try to tell you about four phases of the natural gas business which may be of greatest interest to you and your readers. These subjects, which have been selected because they seem to be the basis of the most frequent discussion and criticism by the public and by the newspapers, are as follows:

1—Rates
2—Vested or Exclusive Rights
3—Advertising and Retail Merchandising
4—Taxes and Excessive Profits.

Perhaps it would be most helpful if I speak of these subjects, so far as possible, in terms of your business. I do this, not only to clarify my remarks, but also because your business and ours have many points of similarity.

Like your industry, ours is privately owned and we both have a given duty to perform, that is, serve the public.

Our business, like yours, is speculative. You cannot foresee the size of future editions, so you must make speculative investments which remain idle much of the time in order to be ready for occasional maximum demand. You spend generously for complete news service so you will miss nothing of importance, even though you know each day much of this news goes into the waste basket. So, too, with us, we acquire a large number of leases and expend large sums of money in geological and geophysical work, endeavoring to classify our acreage so as to drill the more favorable first. Even with all this precaution, approximately 20% of the wells drilled will be unproductive. We construct miles of gathering lines, build large and long transportation lines, install large compressor stations, lay and maintain adequate distribution systems, and much of this whole investment must lie idle except on a few days of peak demand.

Address delivered at the Annual Convention Banquet, Pennsylvania Newspaper Publishers Assn., Feb. 3rd, 1934, Philadelphia, Pa.

Similarity to Newspaper Business

Like your business, we cannot build up inventory in dull or slack periods. Today's paper must be set, printed and distributed today. Just so with the natural gas business; we must distribute our commodity as the consumer desires it. Like you, we must be on duty all the time. In newspaper terms, we have morning and evening editions seven days a week. Your daily cannot limit its editions to Thursday and Friday when advertising volume is up. Your Saturday issue may represent great loss, but it must be printed just the same. We have the same handicap; our invesment and service facilities remain practically the same the year around.

No doubt, other similarities and contrasts between your business and ours will appear as I progress.

Rates—In the span of a single generation, we have moved with incredible speed through the experimental, promotional and consolidation stages of utility development. The utilities have reached the point where they must be properly and scientifically financed if they expect to remain in business for any length of time. Under the law of the land, a utility is entitled to a fair return upon the present fair value of its property, over and above reasonable operating expense including depreciation of reserves. The rate allowed differs somewhat with the type of utility. (With the Natural Gas Utilities it would appear that the maximum rate should be allowed because when the gas is drawn from the sand it is gone, and cannot be replaced by nature. Some utilities continue to manufacture their commodity, while others have everlasting supplies.) The rate usually allowed utilities varies from 7% to 8%. Keeping this in mind on one hand, and listening to the criticism on the other hand, that the gas rates have not come down as fast as other commodities, we must, in order to have a thorough understanding of the subject of rates,

consider the fact that the natural gas rates did not go up as fast as other commodities in pre-depression days, and in recent months when other prices have advanced, natural gas rates have remained stationary for the most part, or have moved downward.

The average domestic rate on natural gas in the Pittsburgh area was 50 cents per thousand cubic feet in 1921. The rate was 60 cents in 1926, the year to whose price level the federal administration is now seeking to return. The average domestic gas rate, for those who use it for heating, has been lowered to the 1921 basis, or 16 2/3% lower than in 1926. This average domestic rate, for those who use it for heating, of 50 cents in the Pittsburgh area compares favorably with the national average of 69.3 cents per thousand cubic feet.

Industry Is Not Depression-Proof

The natural gas industry is far from being depression proof. In 1932, for example, Pennsylvania natural gas companies marketed 17½% less gas than in 1931, 43% less gas than in 1926, and 54% less gas than in 1917, their maximum year.

In spite of this drop in sales we must maintain an adequate investment in wells, lines, compressor stations, etc., and be ready for normal average consumption and the peak demands of winter which rise as rapidly as the temperature drops and with as little warning. The demand may be cut in half the next day but our investment and working force remain the same. Sales of gas to the industrial consumer, when it is not needed for domestic consumer's requirements, help to cover the necessary operating and maintenance expense, and a return on the investment in our property. Since 1926 industrial sales have fallen off more than 50 per cent and the average domestic bill has decreased 25 per cent. A study by one Pennsylvania company shows that 43½% of all bills rendered during the preceding year represented a loss because they did not pay enough to cover the actual cost of the gas used, interest on the investment required to pipe and furnish meters and their proportionate share of our service cost.

So we find that only the income from large domestic, industrial and commercial consumers, enables us to stay in business, just as large advertisers keep the newspapers alive. The average domestic consumer spends less for natural gas for cooking and hot water than he does for cigarettes, namely, $3.00 per month.

It is imperative that the natural gas industry retain its present load and acquire additional industrial load, or the domestic consumer must pay more for his natural gas instead of less. The domestic load is so small during the summer months that it is impossible to make up the loss in the winter by increased domestic sales alone.

When one considers rates, he must have in mind not only the value of the commodity which he is buying, but also the amount and type of service he is receiving. I am sure the effort our industry puts forth to serve its consumers will compare favorably with that of any other industry. We render every type of service necessary to keep gas at your instant call. We maintain a sufficient organization from the well to the consumer to take care of any emergency which may arise, to such an extent that the consumer is usually unaware of this emergency.

We are oft-time asked why the natural gas rates are not uniform in every community. I think the reasons for this are comparable with the fact that newspaper subscription and advertising rates are not the same in all communities, where circulations are comparable.

Reasons for Rate Variations

Here are some of the reasons why our rates vary:

The community's accessibility to or remoteness from the main supply or main distributing system; compact or widely spread population; and whether consumers make limited or extensive use of gas.

Vested or Exclusive Rights—In Pennsylvania, the public service company law regulates all new franchise rights and will not permit uneconomical duplication of service facilities. This is done in order to protect any community from waste of invested capital. But no law gives to the natural gas industry any real right to a monopoly. Natural gas is not used for a single purpose for which we do not have competition from coal, coke, oil or electricity, or from any combination of these. These competitive industries recognize no inherent or vested rights of the gas industry to any portion of its business. They are vigorously contending with every service that gas performs. Therefore, we feel that the individual who buys natural gas does so only because it is the best thing he can buy at a price which represents its true value to him. There is nothing in the law which relieves our managements of constant, efficient operation in order to get new consumers and hold on to the present ones. In other words, there is no legal power which guarantees us either volume or profit.

Advertising and Retail Merchandising—With competition for the consumer's dollar increasing, it is safe to state that distribution is, today, an outstanding factor in most business enterprises. From the very necessity of the case, all business must focus its activities upon finding a market for its product. Here is the source of its income. Toward it, every effort must be turned if the business is to earn a profit and keep going. I think it imperative that the natural gas industry increase its advertising, and make every effort possible to increase its sale; just as it is imperative that your organization increase its volume of advertising and the number of your newspaper sales in order to hold this advertising.

I believe the natural gas industry should be criticized for doing too little advertising rather than for doing too much. We have been too ready to assume that the public knew all about the efficiency, cleanliness and other merits of natural gas. As a result, we may have lost to competition much more of our business than we should have lost.

The natural gas industry has been criticized for advertising and for selling gas appliances. Some of our critics have stated that we should not compete with retail merchants and should utilize in rate reduction that which we spend in advertising. I am sure I do not have to apologize to this audience for advertising a worthy product, nor need to tell you that advertising tends to reduce rather than increase a selling price.

The Merchandising Question

On the question of retail merchandising, the only answer to that is that we must take the lead if it is to be done at all. Our continued existence depends upon keeping present consumers on our lines and adding new ones.

Appliances must be sold to replace obsolete models and to make possible new uses of natural gas, such as today's refrigerator and tomorrow's air conditioning system.

It is imperative that we see that our customers have the most up-to-date and efficient appliances, for the value of gas service is judged by appliance efficiency.

A gas company has a sustained responsibility to a consumer to whom it sells appliances, for the company is

appliances are efficient. If they are not, the company stands to lose a gas consumer to a competitive fuel. Your gas company not only has a responsibility of service but of safety.

We are compelled to meet all forms of competition on the articles above mentioned which are backed by the most extensive program of advertising. Independent merchants cannot be expected to sell only natural gas appliances. Merchants are just as willing to sell coal furnaces as they are to sell gas furnaces and just as willing to sell electric refrigerators as gas refrigerators. They are sensible enough to carry what the customer wants. It is up to us to make the customer want gas appliances.

It seems to me that an impartial and unprejudiced analysis of this question would suggest that the public interest would be far better served by legislation compelling utilities to merchandise tested appliances as a guarantee of satisfactory consumer service and safety, rather than to prohibit them from merchandising.

Taxes and Excess Profits—It is a fairly common opinion that natural gas companies pay no taxes. However, this is far from the truth. It is true that in Pennsylvania we share certain tax exemptions, granted to a number of industries, but we pay other taxes from which many industries are exempt. The natural gas companies which are not public utilities, and also the natural gas utility companies, insofar as their property is not used for utility purposes, pay the usual local taxes, i.e., city, borough, township, school and county. The natural gas industry pays the following State Taxes:

A Bonus Tax which is paid by all corporations.

A Capital Stock Tax from which a large number of Corporations, laundrymen, etc., are exempt.

The usual local taxes on all non-utility property, such as, office buildings, real estate, etc., which are not used exclusively for utility purposes.

The Mercantile License Tax which is paid by all merchants.

They also pay the following Federal Taxes:

Income Tax
Capital Stock Tax
Excess Profit Tax, if any?
Various Miscellaneous Taxes.

It has been claimed by some, that if we paid additional tax that the burden on other citizens would be reduced. The fact is, if we were to remain in business, any additional tax would, by necessity, be passed on to the consumer so that the gas consumer would pay in higher rates, that which he might gain in lower taxes. Keep in mind that the main factor in our rates is our operating expense, so that any additional expenditure involves an increase in rates.

Taxes on natural gas properties in the United States in 1932 amounted to approximately thirty million dollars, which represents 10 per cent of the gross revenue received by the industry. Putting this on a consumer basis, it amounts to five and one-half dollars per consumer. The taxes paid by the natural gas industry in 1933 were 13 per cent greater than in 1931.

As to excess profits, the public service company law permits our industry to earn only a fair return on our investment; that return in many cases has been fixed at 7 to 8 per cent. However, it does not guarantee us a cent. To clarify this point, I might say that the answer to the charge of excess profits in the natural gas industry, is to tell you that the average annual return of some of the largest natural gas companies in the business in Pennsylvania (based not on any appreciated value but on the actual investment) over the last several years has been less than 3 per cent.

We have been subjected to governmental regulation for many years. Some industries are just now being placed under similar regulations. For years, utilities have been complying with state and federal codes. These codes have regulated our business and restricted our profits and we have not been permitted to make excessive profits in fat years to provide against loss in the lean ones. We know of no form of partnership-with-government which relieves us of the necessity of sound, economical and progressive management. In these respects, your business and ours are exactly alike.

If there has been any misunderstanding between our industries, we recognize much of the fault has been ours and occasions, such as this, will do much to remedy this condition.

Improving Customer Relations

(Continued from page 31)

will be advisable to take steps to call back the customer after sufficient time has elapsed to permit of a search into the necessary records. In this connection it should be noted that a rapid means of securing ledger information for the waiting customer, both on a personal call and on telephone calls, is essential.

When a customer specifically requests a written report on the conditions of billing, or when it is impossible to interview a customer personally, the latter method of handling such cases is necessary. A personal interview in the home or in the company office is in most cases preferable.

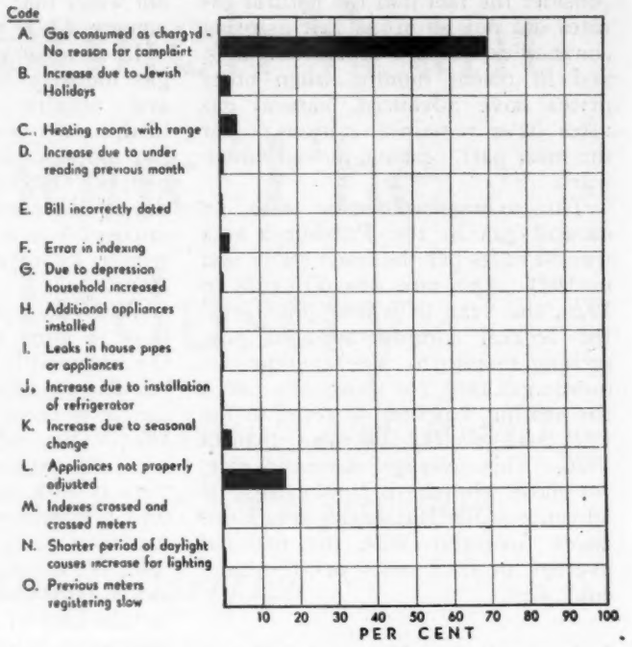

Code
A. Gas consumed as charged - No reason for complaint
B. Increase due to Jewish Holidays
C. Heating rooms with range
D. Increase due to under reading previous month
E. Bill incorrectly dated
F. Error in indexing
G. Due to depression household increased
H. Additional appliances installed
I. Leaks in house pipes or appliances
J. Increase due to installation of refrigerator
K. Increase due to seasonal change
L. Appliances not properly adjusted
M. Indexes crossed and crossed meters
N. Shorter period of daylight causes increase for lighting
O. Previous meters registering slow
10 20 30 40 50 60 70 80 90 100
PER CENT

Chart 3—Summary of District Investigation of All Customers' Statements

Customer's Stated Cause for Complaint	*Per cent Satisfied*	*Per cent Dissatisfied*
1. Usage less—bill the same	78%	22%
2. Normal usage—bill increased	74%	26%
3. Bills differ from neighbor	62%	38%
5. Bill never varies	70%	30%
6. Customer delaying credit action	17%	83%
7. Claims inaccurate index	70%	30%
8. Claims domestic appliance poorly adjusted	85%	15%
11A. Bills higher in new apartment than in old	77%	23%
15. Claims leak caused by company negligence	66%	34%
Weighted Average	74%	26%

Table 5—Percentage of Customers Satisfied and Unsatisfied at Completion of Report by District Investigators—1,550 Cases Studied in Nine Complaint Classifications

Industrial Gas Men Inspect Kiln at Foremost Pottery

E. D. Milener Explains Gas Glost Firing Research Kiln to Representatives from a Number of Gas Companies—Sutton Reads Paper on Direct Mail at Meeting Following Inspection

By HENRY M. RILEY
Editor, American Gas Journal

THE Metropolitan Industrial Gas Sales Council and the Philadelphia Industrial Gas Sales Council met at the Lenox Pottery in Trenton, New Jersey, on the morning of January seventeenth to inspect the Gas Glost Firing Research Kiln which has recently been put into experimental operation there, and to hold a regular meeting afterward. While the majority of the forty industrial gas men present came from Philadelphia and the metropolitan district of New York, it is of interest to note that others came from as far north as Albany and as far south as Washington to derive first hand information on this important project. The far reaching effect of this installation will be realized when one considers that the Lenox Pottery manufactures ware that it is believed in many respects excels the well known makes of pottery from Europe and Asia.

During the last twenty years this organization, which was founded in 1889 by Walter Lenox, has grown and during that time some of the most famous dinner sets in this country have been created at this pottery. These sets include the White House set, sets especially made for some of the best known families in the country, and sets for many of our noted naval and merchant vessels. There are no Lenox "seconds"; every piece of ware that cannot meet the single high standard is immediately destroyed. Each piece is inspected by experts at least a dozen times during the course of manufacture.

The process was outlined as follows:

"High grade china, after first being molded is fired in bisque kilns. Thus the body is created. After sandblasting in order to remove irregularities and create a uniform surface, the ware is dipped in the glost mixture. Immediately following the dipping, the ware enters continuous dryers where the liquid glost is dried. After leaving the dryers, each piece is carefully touched up by hand to insure that the glaze is uniform and that there is a sufficiency of glaze but with no excess. The ware is now ready to enter the glost kilns.

Glost Firing

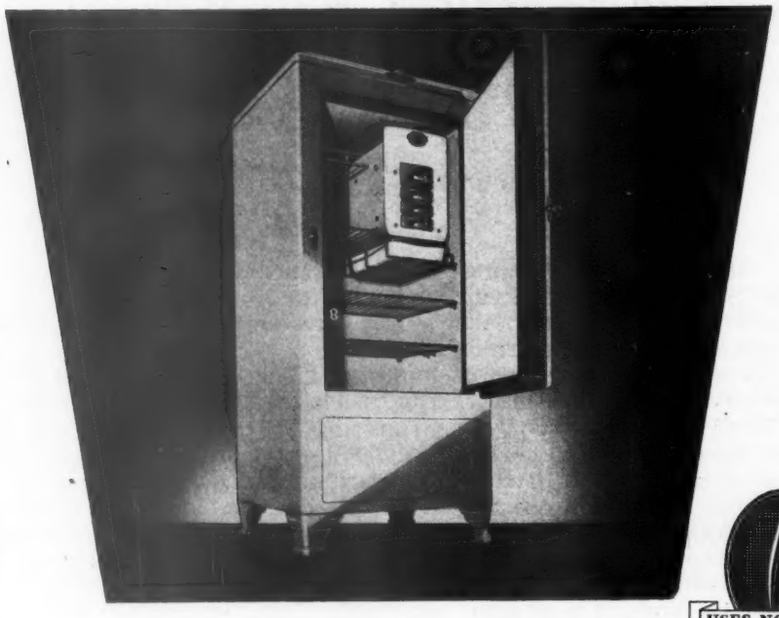
"In the firing of glazes on high grade china, it has been customary from time immemorial to enclose the ware in some manner so as to protect it from the direct fire or direct heat resulting from this fire. This protection has taken the form of saggers, or muffles, or both. In this manner the atmosphere surrounding each piece of ware has been entirely free from products of combustion. Also in this manner it is not only possible to maintain the desired oxidizing atmospheres, but such vaporization of the glaze as occurs is confined in close proximity to the ware and the full effect of the glaze is maintained. The universal extent to which this practice has been followed indicates that it has been satisfactory both as to quality of ware and from the standpoint of factory operations. This same practice has been generally followed in connection with periodic kilns as well as with the more modern car-type tunnel kilns. It can be readily seen that with indirect heating the B.t.u. input per unit of ware is rather high and that there is little opportunity to fully utilize the form value of refined fuels. Furthermore, the cost of building and maintaining muffles, saggers and other protectors is not an inconsiderable item.

"The glazes used in ceramic ware vary in quality and in ceramic firing characteristics. These affect the final quality of the ware and the manner in which they can be fired. Generally speaking, the finer the finish attained the more volatile the glaze must be and more difficult the firing technique. In some of the coarser grades of ware, and especially where inspection is somewhat lax and where 'seconds' are either included in original shipments or sold separately, harsh firing methods can sometimes be resorted to and the usual muffle or sagger protection can be partly dispensed with. Such grades of glazes are usually not very volatile and, therefore, cruder firing practices have been possible.

"The research problem which was attacked on a cooperative basis by the American Gas Association Com-

(Continued on page 37)

GAS COMPANIES ACCLAIM NEW BEAUTY... IMPORTANT NEW FEATURES... OF THE *1934 Air-Cooled* ELECTROLUX



USES NO WATER

Greatest year in gas refrigeration history promised for organizations actively promoting this modern use of gas!

1933 saw all records smashed with the introduction of the new air-cooled models!

Now with the new 1934 Air-Cooled Electrolux, an even greater success is foreseen!

The beautiful new models incorporate every worthwhile modern convenience . . . set a new high standard for refrigerator value. They're finished in gleaming white porcelain, in satin-smooth lacquer, or in a special new finish called Newtone, which will not chip or discolor. Hardware is smart, stainless chromium. And the new salesmaking features include a rubber grid in tray . . . handy vegetable freshener . . . interior lighting.

At the same time, Electrolux offers the famous operating advantages of silence, low cost to run, and freedom from costly repairs. Advantages that have been the deciding factors in the choice of Electrolux by hundreds of thousands of modern American families. Advantages that are unmatched in any other refrigerator.

The 1934 Air-Cooled Electrolux is a refrigerator any woman will proudly own. With a definite selling program — active merchandising — you can feel confident that an important share of the refrigerators installed in your territory this year will be *gas refrigerators!* So make your plans now!

Get the new models on the floor and in your windows at once! Your local efforts will be backed this year by the greatest advertising campaign gas refrigeration has ever had. Seven great national magazines will carry the Electrolux story to 12,000,000 homes each month! Messages going to *your* customers—interesting *your* prospects in Electrolux!

And bear in mind: every Electrolux you sell adds approximately 1500 cu. ft. to a customer's present requirements . . . takes the convenience user out of the non-profit class . . . gives a strong impetus to the sale of other gas-using appliances. For full details and sales and merchandising help, write, wire or phone Electrolux Refrigerator Sales, Inc., Evansville, Indiana.

NEW *Air-Cooled* ELECTROLUX
THE SERVEL *Gas* REFRIGERATOR

mittee on Industrial Gas Research, Public Service Electric & Gas Company, Lenox, Inc., Rutgers University and Surface Combustion Corporation, was to determine whether high volatile glazes could be directly fired in gas combustion atmospheres and, if so, whether the B.t.u. input per unit of ware could be reduced to a sufficiently low point and other advantages devised to make the overall economies and advantages great enough to displace other fuels and the conventional methods of firing them. Among the problems which this research program presented were (1) The determination of whether or not gas atmospheres would be detrimental to the intense bright finishes demanded; (2) Whether the complex atmospheres resulting from a mixture of products of combustion, excess oxygen and vaporized ingredients of the glazes themselves, particularly lead, could be controlled without muffles or saggers to the degree that the 'life' would not be taken out of the glaze by the gases on the way to the stack; (3) Whether the change from radiated heat to convected heat could be controlled sufficiently close to prevent breakage and to prevent a 'scrubbing action' that would cause the glaze to be burnt off of certain parts of dishes, such as the edges; (4) Whether such defects as 'egg-shelling,' 'scumming,' 'pitting,' 'gassing,' 'warping' could be avoided with direct, convected heat firing; (5) Whether absolute uniformity of cross sectional temperature could be retained under all conditions; (6) The determination of a suitable heating and cooling gradient throughout the entire firing period. This gradient is materially affected by the change from radiant to convected heat; (7) The determination of whether kiln length could be materially shortened below anything heretofore attempted; (8) Whether or not walking beam mechanism could be successfully devised to operate at higher than 2000° and whether the walking beam principle could be incorporated as an integral part of the direct firing scheme. (Heretofore walking beams had been limited to less than 1900° and no walking beam had ever been installed in the ceramic industry); (9) Whether firing could be accomplished without the use of the conventional 'dog houses' thus keeping the overall width of the kiln at a new minimum; (10) The development of an automatic control scheme for both temperatures and atmospheres and a control scheme for the walking beam mechanism suitable for ceramic requirements as distinguished from metallurgical requirements where the use of walking beams had previously been confined; (11) The development of new types of 'setters' so as to secure the maximum hourly output at the least expenditure of labor; (12) The development of improved charging and discharging apparatus.

"Laboratory work at the Department of Ceramics, Rutgers University, which was cooperated in by Lenox, Inc., and other pottery plants in New Jersey and Pennsylvania, definitely showed that high grade glazes could be fired with convected heat in controlled complex atmospheres consisting of products of combustion, excess oxygen and vaporized glaze. Definite standards as to time, temperature, atmosphere and rate of flow of said atmospheres were established. Based on these reports, field work was undertaken and designs were made by Surface Combustion Corporation which included the points outlined above as well as others. The new problems that had to be attacked proved to be too numerous and too great and for months none of the objectives were reached. Gradually, however, one after the other of the problems were analyzed in the light of further laboratory work and of actual experience and changes in design and operating practices were made.

"After receiving final inspection of the glaze, the ware is sent to the decorating department. Here artists and artisans of the highest skill decorate the ware, these decorations being fired at comparatively low temperatures."

This project was originated and supervised by the American Gas Association Committee on Industrial Gas Research under the leadership of Mr. F. J. Rutledge, Chairman. Active supervision was handled by a sub-committee composed of the following:

J. P. Leinroth, General Industrial Fuel Representative, Public Service Electric & Gas Company, Newark; J. F. Quinn, Supervising Industrial Sales Engineer, Brooklyn Union Gas Company; E. D. Milener, Industrial Research Representative, American Gas Association.

Assisting them were:

L. S. Briggs and James Tunstall, representing Lenox, Inc.; Prof. G. H. Brown and A. P. Watts, representing Rutgers University, Dept. of Ceramics; E. G. de Coriolis and J. R. Moser, representing Surface Combustion Corp.; J. P. Leinroth and L. R. Bensel, representing Public Service Electric & Gas Company.

Mr. Milener described the operation of the furnace on the ground and, while final data will not be made public until all of the tests and facts are at hand, it was felt that the preliminary findings to date amply support the hope that the kiln will quite meet expectations. During the inspection it was brought out that the kiln would be adaptable to natural gas merely by way of some relatively simple changes in the burner design.

After the inspection of the kiln, which as stated was under fire and delivering actual ware, a tour of the entire plant was made. Of some interest was the showing of service plates priced at twelve thousand dollars per dozen.

At one o'clock the representatives together with Mr. H. A. Brown, President of The Lenox Pottery and Mr. L. S. Briggs, Ceramist, The Lenox Pottery, as guests, convened for lunch at the Carteret Club in Trenton after which a meeting, presided over by Mr. J. F. Quinn, was held. The meeting was devoted to a discussion of the kiln which was led by Mr. Milener and the reading of a paper by Mr. H. A. Sutton on the subject of sending direct mail advertising letters and literature to the industrial gas customers and prospects. Mr. Sutton's paper evoked considerable discussion which was entered into by a dozen or more of those in attendance. Such items as to how detailed the data on industrial gas performance should be made in this direct mail, frequency of mailing, advisability of the industrial representative sending out his own mail matter with his own name signed thereon, etc., were dealt with in this discussion.

Pension Notes

(Continued from page 14)

date the accumulated deficit representing past service credits, would depend to a large extent, on the ages of those employees having long periods of service.

The Gas Industry will do well to continue the good work already started in planning for security in old age of its employees, and management will find employees ready and willing to promptly subscribe to whatever retirement plans which they can count on to assure them independence when they are no longer able to do a full day's work for a full day's pay.

RUUD 1934

New Plans New Models New Improvements

RUUD has not been idle these past three years.

The preparation for the up-break in business has been thorough. New water heaters have been created, old ones have been improved and both have been subjected to severe field and laboratory tests that prove their worth unquestionably.

Results are ready for your inspection in the largest group of quality-built gas water heaters ever offered by this company.

WRITE FOR SPECIFICATION SHEETS AND PRICES

RUUD MANUFACTURING COMPANY
Pittsburgh, Pa.

Factories in
PITTSBURGH KALAMAZOO TORONTO
HAMBURG LONDON

NEWS *of the* GAS INDUSTRY

Extensive Changes Made in Approval Requirements For Gas Water Heaters

The most extensive revisions in, and additions to, the Approval Requirements for Gas Water Heaters that have been made since the adoption of the original code were passed by the Subcommittee at its December meeting. These changes apply to the American Standard Approval Requirements for Gas Water Heaters (Effective July 1, 1934), and although they will not be completed and become effective until some time in 1935 attention is called to them at this time as the proposed revisions will soon be distributed to the industry for criticism. Among the more important changes are the following: (1) An increase in the minimum allowable thermal efficiency for all types of heaters; (2) addition of requirement making mandatory the use of means of relief for excessive temperatures and pressures, and (3) correlation of the construction and performance specifications for thermostats, gas valves, automatic relief and shut-off valves, and draft hoods contained in the water heater requirements, with the listing requirements for such accessories.

Central Hudson Cuts Rates

In an effort to increase house-heating and water-heating loads, Central Hudson Gas & Electric Co. has announced reductions in the gas rate, effective March 1, subject to approval of the State Public Service Commission.

Under the new schedule, gas used in excess of 3000 cu. ft. per month will be sold at 76 cents per M, instead of 95 cents as prevails, and where home gas consumption exceeds 6000 cu. ft. per month, the rate will be reduced further to 54 cents per M.

Principal aim of the new scale is to make gas available to more small homes, according to J. E. Doolittle, district manager. Newspaper advertising on the reductions stresses the point that the rate change amounts to a 15 per cent reduction in the cost of gas for automatic home heating.

Third Building Modernization Exposition Held

The theme "Modernize with Modern Gas Appliances" proved especially appealing to the thousands who attended the Third Building Modernization Exposition, held from January 22 to 27 at Rockefeller Center under the auspices of the *Real Estate Magazine*.

One of the most popular exhibits at the show was that of the Consolidated Gas Company of New York, which featured the 1934 gas appliances and the company's newly inaugurated kitchen planning service.

Visitors at the show were interested in the small model kitchens which were assembled by kitchen planning experts at the booth. These models were made from small wooden blocks, now being used by architects for model building, and scale models of various cabinets, gas ranges, gas refrigerators and other pieces of kitchen equipment.

Many models of modern gas appliances were on display, including the newest air-cooled automatic gas refrigerators.

The gas exhibit was designed under the direction of R. M. Martin, Director of Display, for the Consolidated Gas Company and its affiliated gas and electric companies.

Stamford Gas & Electric Company Adds to Storage Facilities

The Stamford Gas & Electric Co., Stamford, Conn., has started construction of a new oil storage tank which will provide additional storage capacity for oil used in the manufacture of water gas. The new tank, costing $11,500, will enable the utility to receive its oil—which is shipped by water—in barges of greater capacity.

In addition to the tank, the company is building a moat 120 ft. long, and a dyke, 81 x 40 ft. These, with foundation and piping work, bring the total cost of the project to about $17,000.

Natural Gas Companies Sold

Sale of Natural Gas Corp. of Oregon and Natural Gas Corp. of Washington, each operating a group of butane plants within their own State borders, to a group of men headed by Bernard W. Ford, vice-president of Blyth & Co., by Pacific Public Service Co., has been announced by the latter organization. This change of ownership marks the retirement of Pacific Public Service Co. from public utility operation in Oregon and Washington.

Natural Gas Corp. of Oregon operates butane systems at Bend, Coquille, Cottage Grove, The Dalles, Klamath Falls and La Grande, and Natural Gas Corp. of Washington operates similar plants at Anacortes, Camas, Port Angeles, Port Townsend and Shelton.

Pacific Public Service Co. retains control over the Natural Gas Corp. of California, which for some time has been operated as an affiliate of Coast Counties Gas and Electric Co. with headquarters at Santa Cruz. Natural Gas Corp. of California maintains butane service at Yreka, Dunsmuir, Vacaville, Arcata, Fairfield, Suisun, Isleton and El Centro, Calif.

Commercial Council of Consolidated Gas Co. of N. Y., Elects Officers

The Commercial Council of the Consolidated Gas Company of New York and affiliated gas companies elected the following officers at its annual meeting on January 10:

Chairman—G. A. Burrows, Manager, Commercial Department.

Vice-chairman — Henry Obermeyer, Assistant to Vice-president.

Recorder—H. F. Weeks, Assistant Director, Editorial Bureau.

Members of Executive Committee—F. W. Crone, Director, Editorial Bureau; J. A. Malone, Assistant General Sales Manager; C. E. Muehlberg, Assistant General Superintendent, Customers Service Department; and J. F. Rooney, Assistant to Vice-president.

Dividend for Final Quarter of 1933 Passed by Directors of Public Service Co. of Indiana

John N. Shannahan, president of the Public Service Company of Indiana, gas and electric utility, in a letter to stockholders, informed them that the dividend for the final quarter of 1933 on the company's preferred stock has been passed by directors. Increased operating costs under the NRA and larger tax payments to both Federal and local governmental units were cited as reason for the action. The announcement pointed out that $436,588 had been paid in dividends for other periods of the year. The company's revenue during the year decreased more than $1,000,000, the announcement said.

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Automatic Gas Controls
Low Water Gas Cut-offs
Boiler Feed Systems

P. M. LATTNER MFG. COMPANY
CEDAR RAPIDS, IOWA

AMERICAN-BOSCH ACQUIRES KOMPAK

The trade will be interested in the acquisition of the Kompak Company of New Brunswick, New Jersey, by American-Bosch.

The Kompak plant, equipment and organization is now centered in the main works of the United American Bosch Corporation at Springfield, Massachusetts. The entire Kompak sales organization will continue to represent the new owners in the field.

To the 35 year background and experience of Kompak, a recognized leader in the field of gas hot water heaters, are added the extensive research, experimental and manufacturing facilities of American-Bosch.

The manufacturing of American-Bosch *KOMPAK* Water Heaters will continue with the same ideals of quality and service which have characterized the products of both these firms for so many years.

Mr. H. J. Long, formerly president of the Kompak Company, is associated with the engineering and development work of the

GAS APPLIANCE DIVISION,
UNITED AMERICAN BOSCH CORPORATION
SPRINGFIELD, MASSACHUSETTS - - - U. S. A.

NRA WE DO OUR PART

Date Set for 1934 Southwestern Gas Measurement Short Course

At a recent meeting, the general committee in charge of the Southwestern Gas Measurement Short Course, held annually at the University of Oklahoma, selected April 24, 25 and 26 as the dates for the 1934 course. This is a project of the College of Engineering of the University of Oklahoma, of which J. H. Felgar is dean, and the school is held each year in the engineering building on the university campus at Norman, Okla.

Gas-measuring equipment is installed for exhibition and demonstration by the leading manufacturers of such equipment, and factory and sales representatives are present to demonstrate it. The latter, together with university professors of mechanical engineering, are the instructors for this school under direction of Prof. W. H. Carson. Attendance at the school embraces employees of oil, gas and gasoline manufacturing companies who are concerned with the subject of measurement of either dry or casinghead gas. The declared purpose of the school is to increase the accuracy of measurement and the efficiency of regulation to the end that the public may be better served, the dealings between buyer and seller put on a more accurate and equitable basis, and that correct information regarding the engineering and practical problems involved be disseminated among the men in the industry.

Fine Display of Gas Appliances at Farm Show

The gas appliance display at the Pennsylvania Farm Show held in Harrisburg, Jan. 15-19, consisted of 11 booths divided into five sections, in all running for a length of 110 feet.

The center section was devoted primarily to a "style show of gas ranges" under the single important spot word "leisure"—leisure being the result of using a modern automatic gas range. At the direct center of this section a projector threw a series of pictures on a ground glass describing the many features of the present-day improved gas range. The "movement" of the pictures attracted the attentiton of thousands, who remained to examine the appliances.

At each end of this "style show" was an Electrolux gas refrigerator, to complete the center section.

To the left of the "style show" was a section devoted to the display of other ranges and Electrolux refrigerators.

A fine model gas-equipped kitchen, presided over by Elizabeth M. Heldt, home service director of the Harrisburg company, occupied the left end section.

To the right of the center section were displayed Clow gasteam radiators, fireplace heaters, gas refrigerators, gas water heaters—two of which were "cut out" to show insulation and construction—a gas conversion burner, and a warm air space heater.

The right end section showed what could be done with a basement "the gas way." A gas house heater, incinerator and a water heater were the appliances displayed, in front of which—and carrying out the theme of "an extra room in the basement through the use of clean, effortless gas appliances—was a card table and chairs set for a bridge party.

Many of the appliances were connected, adding further realism to the display.

Salesmen were on duty during the entire show, and for the first time since the exhibit was started direct sales were made. These included seven ranges, one automatic water heater and two refrigerators. In addition, more than 100 Class A prospects were secured.

H. S. Christman, sales manager, The Philadelphia Gas Works Company, was chairman of the Association committee on arrangements, and the display was designed by and erected under the supervision of L. C. Heiss, in charge of display work for the P. G. W. Company.

Accurate Meter Reading

Twenty meter readers of the Consolidated Gas Company of New York and affiliated gas companies went through the year 1933 with perfect records of correct meter reading. A total of 1,324,442 meters were read without error by these men during the year.

This was the third consecutive year in which Rubin Fisher, of the Hester Street accounting office, made a perfect record. During 1931, 1932, and 1933, he read a total of 214,388 gas meters without a single error.

L. Lazarescue, of the Hester Street Office, completed two years of perfect meter reading, with a total of 159,265 meters read. F. Pinto, of the Audubon Avenue office, also established a two year record, with 166,880 correct meter readings.

It was said that fewer errors in meter reading were made in 1933 than for any previous year. The average for all meter readers in the Company was one error for every 6666 meter readings.

The meter readers reported that they encountered the usual hazards in their work during the year, including ferocious dogs, dark cellars, and dangerous stairways. One meter reader said that the event of the year as far as he was concerned was discovering a pet wildcat which a customer keeps in a basement.

City Council Approves Natural Gas

The City Council of Greenville, Miss., has given its approval to a survey proposing natural gas for that community. Vice-Mayor Sterling said the city would probably ask the Mississippi Power and Light Co. to bring in natural gas from the line running from Monroe, La., to Memphis.

Proposed Law Would Require Yearly Report on Unclaimed Deposits

Under the provisions of a bill introduced in the Assembly by Michael F. Breen, Democrat, of Troy, and referred to the Public Service Committee, a new section 13-a is added to Transportation Corporation Law, requiring report yearly by gas and electric corporations of all unclaimed deposits of customers and for paying into the state treasury of all deposits unclaimed for 15 years.

Natural Gas in California

Natural gas in California during November amounted to a daily production of 817,000,000 cubic feet, and sales of 512,000,000 feet. The blow off in the air was 57,000,000 cubic feet. October figures were: production 784,000,000; sales 472,000,000; blow off 51,000,000 cubic feet.

Convention Calendar

February

15-16 Mid-West Regional Gas Sales Conference, Chicago, Ill.

March

6- 7 Oklahoma Utilities Association, Tulsa, Okla.
21-23 Joint Conference Southern-Southwest Regional Gas Sales Council—Commercial Section, A. G. A., Peabody Hotel, Memphis, Tenn.
23 New Jersey Gas Association, Trenton, N. J.
25-30 American Chemical Society, St. Petersburg, Fla.

April

9-10 American Gas Association Distribution Conference, Detroit, Mich.
16-18 Mid-West Gas Association, Sioux City, Iowa.
19-20 Missouri Association of Public Utilities, The Elms Hotel, Excelsior Springs, Mo.

May

1- 4 U. S. Chamber of Commerce, Washington, D. C.
14-18 National Fire Protection Association, Atlantic City, N. J.
24 National Board of Fire Underwriters, New York, N. Y.

June

4- 5 Canadian Gas Association, Montreal, Can.
18-21 National Association of Purchasing Agents, Cleveland, O.

October

Week of 29th—American Gas Association Convention and Exhibition, Atlantic City, N. J.

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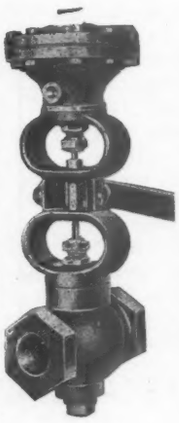
WHERE natural gas is introduced into systems designed for manufactured gas, dust troubles may arise. Oil fogging is the remedy—adding to the gas a certain proportion of oil in vaporized form. The devices for doing this must vary, according to operating pressures and other conditions. In any case, however, some type of diaphragm valve is called for. Chaplin-Fulton valves, of both the differential and the throttling types, are available for all such uses. Correspondence is invited on this or on any subject relating to gas regulation or other pressure control. C-F regulators have been known to the gas industry for forty years. Catalogs on request.



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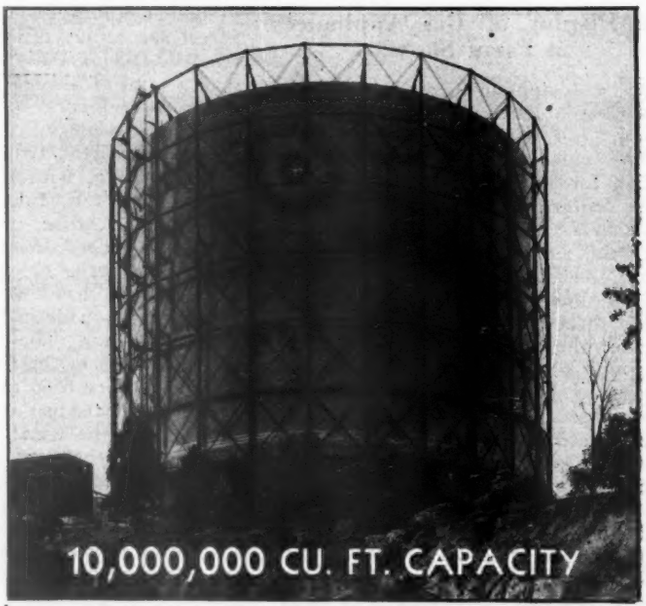

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Personals

F. O. Suffron was recently appointed head of the research department of the A.G.A. Testing Laboratory to fill the vacancy created by the resignation of W. M. Couzens on December 1, 1933.

Mr. Suffron has a background of twenty years' experience in the field of engineering, the majority of which time he spent in the gas industry.

He graduated in civil engineering from Oregon State College in 1915. From 1916 to 1920 he was employed as Engineer of Tests for Smith, Emery & Company, Consulting Engineers and Chemists, of San Francisco, California. For the succeeding nine years Mr. Suffron was associated with The Portland Gas and Coke Company, Portland, Oregon, as an engineer in the Distribution Department. During 1930 and the early part of 1931 he held the position of Gas Distribution Engineer with the Washington Gas and Electric Company, from which position he resigned to come with the A.G.A. Testing Laboratory in Cleveland.

During the past three years Mr. Suffron has been engaged largely in research at the Testing Laboratory.

Mr. Paul R. Buchanan was elected a vice-president at a recent meeting of the board of directors of the Hartford Gas Company. All other officers were re-elected as follows: **E. E. Eysenbach,** President and General Manager; **J. A. McArthur,** Secretary and Treasurer; **M. J. Coughlin,** Assistant Secretary, **Wm. A. Kneeland,** Assistant Treasurer.

Mr. Buchanan's connection with the company began April, 1915, when he became plant superintendent and had charge of the combination coal and water gas plant until 1926 when he was made General Superintendent in charge of operations. He now becomes assistant to the General Manager with his new office as Vice-president.

Mr. Buchanan was graduated from Cornell University in 1910 and went to the United Gas Improvement Company as a cadet engineer. For a year and a half he was with the Kansas City Gas Company in its distribution department, later returning to Philadelphia where he became associated with the U. G. I. in various phases of the business.

Mr. Buchanan has been active in the affairs of the industry and has just finished a term as Chairman of the Operating Division of the New England Gas Association.

George Ferguson, for nearly eight years manager of the San Clemente-Capistrano branch of the San Diego Consolidated Gas and Electric Co. at San Clemente, has been promoted to the position of manager of a special business department of the company. Mr. Ferguson has moved his headquarters to San Diego.

George W. Westerman, formerly in charge of the display department for Consumers Power Co., Jackson, Mich., and now having general supervision of all display activities for the entire Commonwealth and Southern group of utility companies, has been honored by the International Association of Display Men through his election as president.

This election carries special distinction, since Mr. Westerman is the first public utility man ever to be chosen for an executive position in the International association. His election has just been announced following an executive meeting of the organization at Chicago.

Mr. Westerman's department, which includes among others the Consumers Power Co., has repeatedly won national and international honors in competition with the window and other displays submitted by all branches of the mercantile industry at various conventions.

Alfred Harrison, editor of the GAS JOURNAL OF LONDON, will retire from that position on March 31st next. It had been intended that he should give up the more exacting part of his work at the close of 1933, but Mr. Harrison's absence in America on the Institution tour, and the consequent accumulation of work, left inadequate time for him to hand over to his successor before the end of the current volume.

Mr. Walter Rupert King, elder son of the late proprietor, Walter King, will succeed Mr. Harrison as editor, thus following in the footsteps of his father and grandfather.

Charles S. McCain has resigned as chairman of the board of directors of the Chase National Bank to become president and chief executive officer of the United Light and Power Co. **William Chamberlain,** who is now president of United Light and Power, will become chairman of the board.

H. L. Helmly has been installed as president of the Savannah Gas Company's Employees' Club, succeeding Miss Lena Schuenemann in that office. Installation was made at the usual Christmas Dinner and meeting of the organization, held on December 25 at the Hotel Savannah.

H. L. Farrar has been appointed president of the Coast Counties Gas & Electric Co., taking the place vacated by the resignation of J. B. Wilson, who has accepted a public utilities post in the East. Mr. Farrar was formerly vice-president of Coast Counties Gas & Electric.

Thomas F. Kennedy, general new business manager of Henry L. Doherty & Company in New York, has greatly improved from his recent illness. It was learned that Mr. Kennedy returned to his home from the Polyclinic Hospital in New York shortly after Christmas, after being in the hospital some two months. He has recovered sufficiently to go to Florida to recuperate, having left for Florida on Tuesday, January 9.

A. A. Klinge, manager of safety for the Public Service Company of Colorado was recently appointed state director of safety for the civil works projects and conservation camps.

Raymond D. Burmaster, sales supervisor of the Ottumwa Gas Co., Ottumwa, Iowa, has been elected president of the Junior Chamber of Commerce, in which he has been active.

Deane L. Weaver, southern California manager for Henry L. Doherty and the Cities Service, has accepted the resident managership of H. R. Baker and Company, with headquarters in the Quinby building, 650 South Grand avenue, Los Angeles.

Sidney C. Singer, division manager for the Southern California Gas Co. at Glendale, Calif., has been named president of the Glendale Kiwanis Club for the ensuing year.

Obituary

CLARE N. STANNARD

Clare N. Stannard, vice-president and general manager of the Public Service Company of Colorado, died January 3, of pneumonia. He was born in Friendship, N. Y., in 1869, and after graduating from high school joined the Binghamton Gas and Electric Company. In 1898 he joined the Denver Consolidated Electric Company, which now forms part of the Public Service Company. When William J. Barker, vice-president and general manager died, Stannard was promoted to that office and while ever a strict disciplinarian, his manner was to make friends and keep them. He was active in welfare work in Denver and was never too busy to give part of his time and money to worthy causes. His wife died last year. One son and two daughters survive.

C. S. SPAULDING

Charles S. Spaulding, for more than 21 years superintendent of the Newburyport Gas and Electric Co., Newburyport, Mass., died at his residence there, January 8th, in his 77th year.

Mr. Spaulding was born in St. Johnsbury, Vt. Before coming to this city in 1900 he was connected with gas and electric light plants in Allston and Wakefield, Mass. He had managed the local plant there for 21 years at the time of his retirement.

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GROUND KEY GAS STOPS of Standard, Extra, Special or Heavy Service Types—with Flat Heads, Square Heads, Lock Wings, Lever Handles, etc.—all Brass Stops or Iron Body Stops with Brass Plugs—they're all made by Kitson (and have been for years).

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BOOK REVIEW

Data on Stainless Steels Compiled in Book Form

The Book of Stainless Steels; edited by Ernest E. Thum. Published by The American Society for Steel Treating, Cleveland, Ohio. 631 pages. 289 illustrations. Price $5.00, postpaid.

A gap in the field of technical literature has been filled with the publication of this volume. Heretofore there existed no book describing American usage and practice.

No less than 77 authorities on making and using the many kinds of heat and corrosion resisting chromium alloys collaborated to write this book under the editorship of Ernest E. Thum, editor of Metal Progress. Each man was selected to write a chapter for the book on his particular specialty in the field.

The text is therefore authoritative, and because of careful planning and editing, it resolves itself into a logical and consecutive compendium of practical information with the emphasis on the uses of the various types of stainless steels. About two-thirds of the chapters describe the properties of the steels—how to fabricate them and what to expect of them. Others tell of a multitude of successful applications described by men in the consuming industries who know about these applications, intimately.

The ever-widening field of use for stainless indicates that "The Book of Stainless Steels" will be of value in many industries from the manufacture of artificial silks to the building of heavy machinery. The reader of this book certainly need not be a highly trained metallurgist to profit from it, but even the most demanding technical man will find plenty of precise information.

It is felt that many gas men will be interested in this work; the industrial gas engineer will derive from it much information of value by reason of many industries which he serves making liberal use of such materials, and the various operating departments of the gas company will gain by its reading because of their widespread use of various metals which stainless steels might profitably supplant.

The book is bound in durable red cloth and is 6 by 9 inches. Orders may be sent direct to the American Society for Steel Treating, 7016 Euclid Avenue, Cleveland, Ohio, with the understanding "money back if not satisfied."

Important Thermal Text

Industrial Heat Transfer by Alfred Schack. Published by John Wiley & Sons, Inc., New York, N. Y. 371 pages. 40 illustrations. Price $5.00 net.

This work which appeared originally in German and which has been translated into English by Hans Goldschmidt and Everett P. Partridge differs from most other texts on the same subject in that "the interests of the practical engineer have been particularly considered." While the handling of such a subject necessarily cannot be made "easy", still the author has managed, wherever possible, to develop simple, usable equations. In other words, the solution of various problems has been simplified as much as possible to the end that those qualified to deal in such matters will "not spend half their time in digging out the necessary data and equations."

The discussion of the theory and practical application of the following subjects appear in logical sequence in the book:

Heat Transfer by Conduction; Heat Transfer by Convection; Calculation for Heat Exchangers; Heat Transfer in Industrial Furnaces; Heat Transmission and Pressure Drop; Numerical Examples in Heat Transfer; Compilation of the Most Important Equations for Heat Transfer; Important Physical Constants for Heat Transfer.

In addition there is an extensive listing of authorities cited.

Many gas engineers who daily come in contact with problems involving the generation and economic handling of relatively large quantities of heat should find this work of more than passing value. Industrial gas engineers should be especially interested in the chapter, "Heat Transfer in Industrial Furnaces."

Forty-five pages are devoted to numerical solutions of several heat transfer problems. Some of these are as follows: Simple Plane Wall; Composite Plane Wall; Simple Pipe Wall; Composite Pipe Wall; Composite Pipe Wall with Gas Leakage; Sudden Cooling or Heating of the Surface of an Infinitely Thick Wall; Heat Flow in a Wall of Finite Thickness After Sudden Change of the Temperature at the Surface; Approximate Method of E. Schmidt for the Calculation of Heat Flow in Plates; Parallel and Counter Flow Recuperators; Calculation of a Regenerator, etc.

New Handbook of Arc Welding

Procedure Handbook of Arc Welding Design and Practice. Published by The Lincoln Electric Company, Cleveland, Ohio. 434 pages. 495 illustrations. Price $2.50, domestic postage prepaid. Foreign postage 35 cents.

Marking a milestone in the literature of welding, the publication of "Procedure Handbook of Arc Welding Design and Practice" makes available in one volume complete and up-to-the-minute information on both design and procedure for arc welding.

The book is encyclopedic both in conception and contents and is divided into eight principal sections or parts. Each of these deals with an important phase of arc welding and its application in a clear, concise manner, amply illustrated with well executed detailed drawings and photographs.

Since the history-making developments of the last few years in arc welding have made most available books on the subject obsolete, the publication of the new "Procedure Handbook" is particularly timely. It is prepared not only for the use of all welders and departmental heads of welding departments but also for those responsible for the design of products which may be built by welding. The data included on procedure, speeds and welding costs are particularly valuable.

The eight sections of the book cover the following subjects:

Part I, Welding Methods and Equipment; Part II, Technique of Welding; Part III, Welding Procedure, Speeds and Costs; Part IV, Structures and Properties of Weld Metal; Part V, Weldability of Metals; Part VI, Designing for Arc Welded Steel Construction of Machinery; Part VII, Design for Arc Welded Fabrication of Steel Structures; Part VIII, Typical Applications of Arc Welding in Manufacturing Construction and Maintenance.

Among the subjects treated in detail are, descriptions of various welding processes. definition of welding terms, classification of welds, strength of welded joints, methods of stress relieving, tabulations of speed of welding all types of joints in all positions, methods for estimating cost of weld production, structures and properties of weld metal, specifications for steels and alloys of good weldability, the welding of nonferrous metals, comparison of limitations of rolled steel and cast iron in machine design, construction details of basic machine parts built by welding, treatise on fundamental advantages of arc welded and riveted steel structures, details of structural arc welding, welding of automotive parts, construction and repair of bridges, use of arc welding in cement plants, gas plants, machine shops, mines, refineries, pipe lines, railroad shops, steel mills, shipyards and hundreds of other interesting subjects.

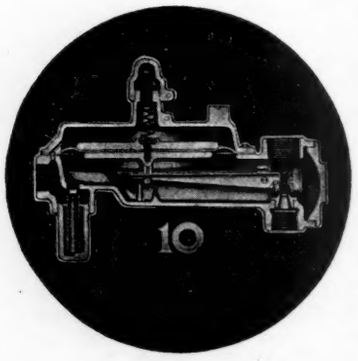
The book has been made 5¾ x 9 inches and bound in semi-flexible simulated leather embossed in gold. A comprehensive index has been included.

3 OF A KIND~

REYNOLDS 10 - 20 - 30 Regulators are a winning combination for every type of service requirement. Reynolds regulators have proved their superiority over a period of 40 years. However, it is one thing to claim superiority but quite another to back it up with untampered facts. Reynolds have the back records of performance, measured in terms of years, in their files. From where are these records taken? Here, there, and everywhere, where gas is used for commercial purposes.

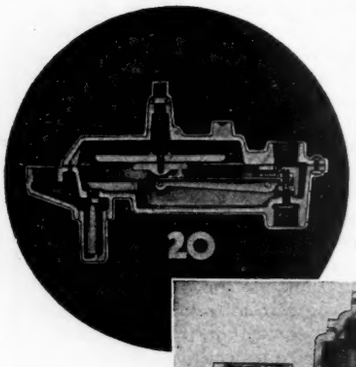
What do they show? Satisfaction.

In order to improve manufacturing methods and introduce new developments, Reynolds compare the results gathered over years of actual operating performance with the original specifications of the Regulators and, also, determine for what length of time the Regulators fulfill the needs of the particular type of installation. In this way Reynolds keep their products keyed to the needs of a fast moving industry.



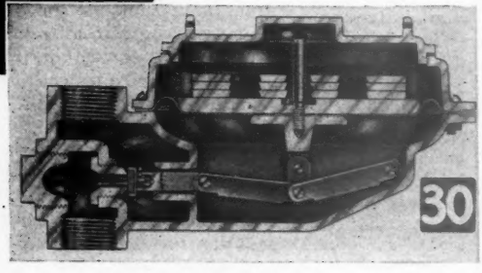
For complete information write to either the Factory, Branch Offices, or Representatives.

Model 10—all parts accessible and interchangeable while in pipe line.



Model 20—working parts so accurate as to permit complete interchangeability in shop.

Model 30—is manufactured in either spring or dead weight adjustment for horizontal or vertical connections.



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for carburetting gas requires high pressure and high temperature.

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remain tight and are easily cleaned. These are the requirements for continuous satisfactory operation.

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TRADE NEWS

Kompak Water Heater Acquired by United American Bosch Corporation

Officials of the United American Bosch Corporation, Springfield, Massachusetts, announce that that company has acquired the assets and good-will of the Kompak Company, of New Brunswick, New Jersey, manufacturers of automatic gas water heaters since 1907.

The entire equipment and organization of the Kompak Company has been moved to Springfield, where manufacturing will be continued in the American-Bosch plant. Mr. R. W. Washburn, Secretary and Assistant Treasurer of the Springfield firm for many years, will direct the operations of the Gas Appliance Division formed by the acquisition of the New Jersey company.

Mr. H. J. Long, of Kompak, and looked upon as a pioneer in the gas water heating industry, is associated with American Bosch in engineering and development work. The complete line of copper water heaters developed by Mr. Long, including types for small homes, large homes, apartment houses and institutions, will be manufactured in Springfield. The entire Kompak sales organization will continue to represent the new owners in the field.

George H. Cressler Now Member of the Graver Tank & Mfg. Corp.

George H. Cressler, former Vice-president and General Sales Manager of the Stacey Manufacturing Company and Vice-president of the Stacey Brothers Gas Construction Company of Cincinnati, Ohio, has become a member of the organization of the Graver Tank & Mfg. Corp.

He graduated from Yale University, the Sheffield Scientific School in 1902. Prepared for college at the Hill School, Pottstown, Pa. From 1902-1914 was with the Kerr Murray Manufacturing Co., Fort Wayne, Indiana. Vice-president in charge of Sales and Engineering 1910-1914.

1914-1918 member of the firm of Walker and Cressler, Consulting Engineers, Chicago, Ilinois, Specializing in Public Utility Engineering, design and construction.

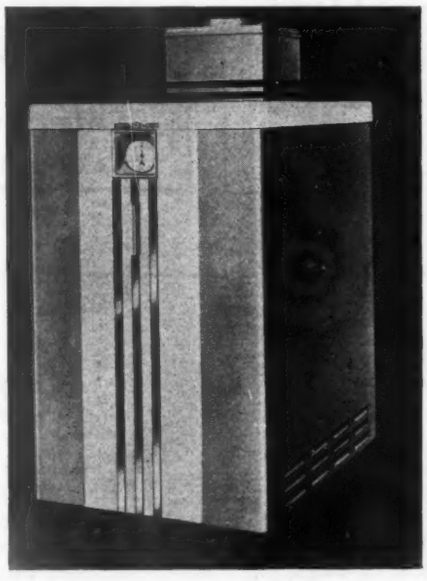
1918-1920 Commissioned officer in Ordinance Department, U. S. Army. Placed in charge of construction Government Synthetic Toluol Plant, adjacent to General Petroleum Company's Refinery, Los Angeles, California, and later in 1918 similar government Toluol plant at Standard Oil Company Refinery, Richmond, California. December, 1918, placed in charge of all Ordinance projects on Pacific Coast for settlement with Contractors, dismantling of plants and disposal of materials.

1921 General Sales Manager of the Stacey Manufacturing Company, Cincinnati, Ohio. In October, 1931, also appointed Vice-President of the Stacey Manufacturing Company and of the Stacey Brothers Gas Construction Company of Cincinnati.

Member of Engineers Club of New York City, University Club of Cincinnati, Ohio, Yale Club of New York City.

General Electric Co. Announce New Gas Fired Furnace

The General Electric Company, Schenectady, N. Y., announce a line of gas burning furnaces. The furnace will be a coordinated unit with burner, boiler, control and all parts enclosed in a single jacket of distinctive appearance, and G. E. air conditioning dealers throughout the country will be ready to make installations early in March. In addition to the dealers now handling



G. E. oil furnaces and air conditioning equipment, new dealers are now being appointed in territories not covered and where natural gas is easily available.

To provide a central location for shipping and to be near the natural gas territory, the new furnaces will be manufactured in Cleveland. A factory has already been equipped and production is under way.

In commenting on the new gas furnace, J. J. Donovan, manager of General Electric's air conditioning department, said:

"Various sizes of gas furnaces will be available for residential, commercial and small industrial applications, and also for large quantities of hot water. The G. E. gas furnace will also be interchangeable with the G. E. oil furnace as part of the G. E. air conditioning system. Each dealer will have factory trained engineers for servicing and installations. The Air Conditioning Department of the company and the G. E. air conditioning dealers will cooperate with gas utilities in promoting the gas furnace."

Change of Company Name

At the annual meeting of the stockholders of The Connersville Blower Co., Inc., held on January 23, 1934, action was taken to change the name of the company to Roots-Connersville Blower Corp., thus indicating to the public the units making up the company.

The management of the company will continue as heretofore, without any change in personnel. The officers are: L. J. Brown, chairman of the board; J. S. Tatman, president; B. C. O'Brien, 1st vice-president; G. W. Ansted, 2nd vice-president; W. E. Newkirk, treasurer, and Emery Huston, secretary. The board of directors, in addition to Messrs. Brown, Tatman, O'Brien and Ansted, includes the following: F. S. Heath, E. D. Johnston, Wayne Stacey, C. A. Thompson, and Joseph M. Wilkin.

One of the units now comprising Roots-Connersville Blower Corp. dates back to 1854, and all have engaged in building the same line of equipment for many years, including rotary positive blowers, gas pumps, gas meters, liquid and vacuum pumps, etc. Within recent years, a complete line of centrifugal pumps and blowers, based on designs perfected during many years of experience of engineers now connected with the company, has been introduced.

Herske Appointed Vice-President and General Manager of American Radiator

Arthur R. Herske, for the past three years sales promotion manager for the American Radiator and Standard Sanitary Corporation, has been appointed vice-president and general manager of sales for the American Radiator Company, according to an announcement from Rolland J. Hamilton, president of the company. For two years before he became sales promotion manager for the parent corporation, Mr. Herske held the same position with the American Radiator Company.

In his work with the American Radiator Company, Mr. Herske has built up a carefully organized sales promotion program based upon the theory that heating should be merchandised by telling "the story of comfort, convenience and cleanliness and not the story of cast iron."

To carry out this method of approach, he instituted regular seasonal campaigns on heating products, promoting different products at seasons of the year when their use would have the greatest appeal for the home or property owner.

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Least resistance to flow of gas — longer life — quick and complete revivification.

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THE GOODMAN STOPPER
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USED SINCE 1897
2" HANDLE & LOCKING SLEEVE
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Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.
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THE PERFECT READY MIXED OXIDE
For Gasworks having no facilities to mix their own Sponge we offer our celebrated "Lux Sponge," guaranteed efficient for Coal or Water Gas.
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1876 [USE THE BENEFIT of 57 YEARS EXPERIENCE] 1933

Jane Wagner Appointed Home Service Director of Electrolux Refrigerator Sales, Inc.

A Home Service Division, with Miss Jane Tiffany Wagner, a leading national expert in home economics, as director, has been created by Electrolux Refrigerator Sales, Inc. The purpose of the new division is to collaborate with the many gas utilities throughout the country who maintain home service facilities to assist their sales divisions in the marketing of Electrolux refrigerators and other appliances.

Jane Tiffany Wagner

The headquarters of the new Electrolux Home Service Division, located at 51 East 42nd Street, New York City, adjacent to the company's eastern offices, will be open to all persons in the gas industry interested in refrigeration, including officials, sales representatives and those connected with the home economics departments.

It is planned to make the Division a clearing house for all sorts of home service information, the development of new ideas for Electrolux users, advice on use of refrigerated foods, on nutrition, and cookery as it relates to refrigeration. The new Division will also collaborate in the preparation of home literature for distribution to the home service departments of the gas utilities marketing Electrolux. Setting up of a "research kitchen" where actual food research work will be carried on is also in contemplation.

Miss Wagner, who is in charge of the new division, was formerly director of the Home Service Division of the Consolidated Gas Company of New York, a post to which she was appointed upon the recommendation of Columbia University.

Under Miss Wagner's direction, the Consolidated Gas Company's Home Service Division was re-organized, and a number of new departures inaugurated, one being the answering of complaints and following them up with visits from home service workers who gave practical demonstrations of the workings of various gas appliances. Another of Miss Wagner's duties with the Consolidated Gas Company was to "sit in" at conferences of the district managers as a way of acquainting herself with home service problems in individual districts.

Miss Wagner began her training as a home service expert by attending the Iowa State College of Agriculture and Mechanical Arts at Ames from which she was graduated in 1927 receiving a B. S. degree in Home Economics. While at Ames she took a summer course in interior decoration and applied design at the Art Institute of Chicago. She taught school for a year after graduation. Later she became "home economist" with a food concern in Rochester, New York. Her course at Columbia University in Household Arts Education given in Teachers College was completed in 1931, the University bestowing upon her the degree of Master of Arts.

New Bulletin on "Hoists" Issued

The Harnischfeger Corporation, 4400 West National Avenue, Milwaukee, Wisconsin, has issued a new bulletin on "Hoists" for every plant and purpose. This publication treats upon the application of hoists to both general and specific problems. Profusely illustrated in color with photographs of installations and diagrams explaining simplified construction and operation, it covers the vital points in modern hoist design. The bulletin lists the ratings and operating ranges for type "R" hoists along with specifications and electrical accessories. Copies may be had upon application to the company's agents and representatives or to the factory directly. Ask for Bulletin No. RH-1.

New Corporation Formed

The Smith-Mayer Corporation, 16374 Euclid Avenue, Cleveland, O., has recently been formed. This concern is to engineer and manufacture industrial ovens, conveyors, air heaters, air conditioning and allied equipment.

The Smith-Mayer Corporation was formed by Mr. James Campbell Smith, and Mr. C. F. Mayer, both formerly with The Swartwout Company. During the past fifteen years, Mr. Smith and Mr. Mayer, in their various connections, have been responsible for the negotiation, engineering and installation of a great number of the country's largest Core and Mold Drying, Japanning, Lacquer Drying and General Drying and Conveying Systems.

A. B. Clark Appointed General Traffic Manager of Union Carbide

A. B. Clark has been appointed general traffic manager of the operating companies of Union Carbide and Carbon Corporation, it was announced at the corporation's home office, 30 East Forty-second Street, New York City.

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Has Demonstrated That It Is By Far The Most Economical

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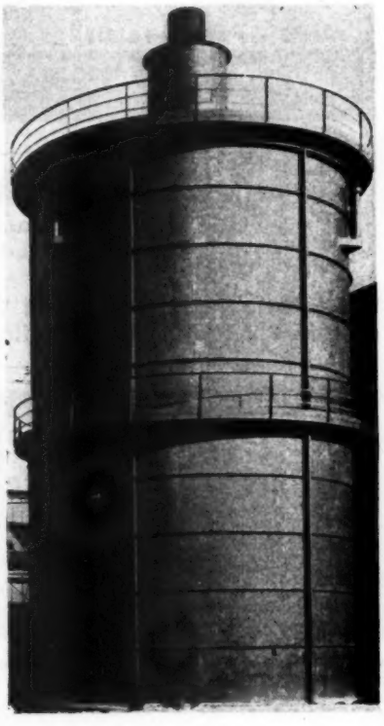
To Maintain and To Operate

In All Capacities



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